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MEDICAL GROUP PRACTICE

That medical group practice is becoming popular is indicated by the response to an A.M.A. questionnaire in 1944, in which 52% of the medical officers in the armed forces stated that they would like to enter private group practice after the war. More and more students emerging from our medical schools seem also to have a similar idea.

What is the concept of group practice that makes it so attractive to so many, yet causes others to oppose its widespread use?

In a recent series of articles on this subject, Hunt and Goldberg (1a,b,c,d) present an analysis of group practice based on studies of existing medical groups. In their discussion of its many facets, the authors give a clear picture of the various types of groups included in the survey.

A medical group may be defined as a formal association of three or more physicians providing medical services, with the income from those services pooled and redistributed among the members in accordance with a pre-arranged plan. The most common type of organization is the partnership, most of which have employed physicians.

What is there about this plan that displeases its opponents?

It is maintained by those who disagree with the concept of group practice that patients can be adequately treated by individual practitioners; and it is inefficient, time-consuming and unduly expensive to give every patient the questionable benefit of being treated by several physicians in offices "over-fitted" with the latest diagnostic and therapeutic equipment. Furthermore, they claim, patients may be "sent through the mill" of several consultations with an eye toward the fee rather than real, medically indicated need. Though even opponents of the plan admit that consultation is made easier by the constant presence of specialists of various skills in the same office, they feel that the number of patients needing specialists' care (only 10 to 15% of the total) does not warrant the widespread use of group practices.

The most serious fault that opposition finds with the group practice is the disturbance of the "patient-doctor" relationship which they feel is inherent in this type of treatment.

Those who are in favor of group practice and looking forward toward taking part in one, find the arguments of the opposition very weak as compared to the benefits they feel group practice can give to the patient and to the doctor. The very fact that they feel a need for such practice means that they seriously question the opposition's claim as to the number of patients needing specialist care; and they feel there is little need for concern over loss of the "patient-doctor" relationship which need not occur except in cases where the group has grown to the size of a hospital-clinic.

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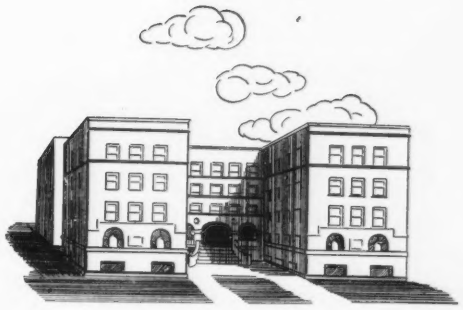

The advocates of group practice feel that modern medicine is now so complex that no one physician can comprehend many of the finer points of diagnosis and treatment. As a result, extensive numbers of sick people—if they are to receive adequate, let alone the best, medical care—must be seen by more than one physician. The only way in which this can be done efficiently and economically is by the organization of doctors into groups where the consultants may be near in time and space.

Benefits to the doctors, under this plan are many. Young specialists, who often lose much of their skill during the initial hardships of building up a practice, could concentrate on their specialties from the beginning by entering groups. The constant close association with other physicians spurs the individual doctor in a group to keep abreast of medical progress. The very nature of the organization—the ever-present stock of tools and equipment, the reduction of time and effort in routine procedures, the nursing and secretarial help provided—all free the doctor from harassing cares that trouble the private physician.

The proponents of group practice point out that, although the income of doctors participating in groups may not be as large as that of more successful private practices, groups guarantee more stable and regular incomes. And to the young and the old doctor, a group practice is more lucrative than a private one. The more regular hours and the greater opportunity to take planned vacations and post-graduate study without too much danger of jeopardizing his practice, makes many a doctor prefer to work within a group.

There are benefits to the patient, too, in group practice, its advocates claim. Each patient gets more thorough and meticulous care when his doctor isn't worried about those in the full waiting room. And a less tired, more up-to-date physician means more service to his clients.

The controversy concerning group practice of medicine seems to hinge on three points:

(1) Whether or not 80-90% of patients suffer from illnesses that can be adequately treated by a well-trained general practitioner, and whether or not the 10-20% of patients who need specialist care would receive better care if their private physician is free to refer them to the best specialist available.

(2) Whether or not group practice can provide adequate specialist care.

(3) Whether or not the patient-doctor relationship would be destroyed by group practice.

With the current bogey of "socialized" medicine versus private practice presenting a dilemma to the modern physician, his way out may lie in the adoption of the group as the future type of medical practice. At the present time, there seems to be a definite need for such types of medical service, both for the physician and patient.

1. (a) Hunt, G.H.: Medical Group Practice in the United States: I. Introduction, New England J. Med. 237: 71-77, (July 17) 1947.

(b) Hunt, G. H., and Goldstein, M. S.: Medical Group Practice in the United States: II. Survey of Five Groups in New England and the Middle Atlantic States, New England J. Med. 237: 719-731 (Nov. 13) 1947.

(c) Hunt, G. H., and Goldstein, M. S.: Medical Group Practice in the United States: III. Report of a Questionnaire Survey of all Listed Groups, 1946, J.A.M.A. *135:* 904-919 (Dec. 6) 1947.

(d) Goldstein, M. S.: Medical Group Practice in the United States: IV. Organization and Administrative Practices, J.A.M.A. *136:* 857-861 (March 27) 1948.

EXTRA RENAL AZOTEMIA AND LOWER NEPHRON SYNDROME*

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THE lower nephron syndrome is a syndrome of diverse etiology, affecting essentially the cells of the tubules of the kidney, and especially those of the ascending loop of Henle and the distal convoluted tubules. Pathogenetically, the common factor is probably anoxia. The clinical picture depends on the degree of anoxia and the period of its duration, and is characterized by oliguria, often characteristic urine findings, and azotemia, probably due to a non-specific reabsorption of the glomerular filtrate by damaged tubular epithelium.

The question of terminology for these varied states has received consideration. According to Bell (1), and others, a differentiation is made between a "true" extra-renal azotemia and the lower nephron syndrome. According to Lucke (2), a re-evaluation of the kidney findings in cases of extra-renal azotemia would show the recently described renal changes in most cases. Nor is it sure that the negative findings in some cases of extra-renal azotemia may not be due to very early changes which are not apparent by our methods of study. For purposes of this paper, it will be considered that extra-renal azotemia and lower nephron syndrome are synonymous.

Historically, the picture was described separately for many conditions and by many authors. Such terms as acute Bright's disease, acute parenchymatous nephritis, and acute tubular nephritis were used. When modern classifications of kidney disease were proposed, this entity was dropped and its significance generally forgotten. Kidney lesions were described in such disparate conditions as burns, hemoglobinuria, shock, acute infections, etc., as far back as 1823 (3), but it was not until Jeghers and Bakst, in 1937 (4), categorized our knowledge, described the basic mechanisms, and emphasized the comparatively minor pathology in the kidney under the term **extra-renal azotemia,** that the picture rounded into a definite pathologic and clinical syndrome. The syndrome was most lately and most completely described by Lucke (2), in 1946, who stressed especially the pathology. The importance of this syndrome and its application to present day clinical medicine remains to be emphasized, and this indeed is the purpose of this paper.

The lower nephron syndrome has been described in a multitude of clinical states, which cover the field of medicine in all its specialties. It concerns the dermatologist as well as the surgeon, the physical therapist as well as the internist. There seems to be no diseased state in which the syndrome may not occur. Its role may have to be assessed even in experimental and investigative medicine, as coloring certain results and findings. The condition, in varying degree, is ubiquitous in medicine.

Beside the organic lesions of nephritis, nephrosis, nephrosclerosis, post-renal blocks and structural anomalies of the kidney, renal lesions have been described in shock of all kinds, in peripheral vascular collapse (5), in severe trauma to muscles (crush syndrome) (6), in non-traumatic muscular ischemia (4), in hemoglobinurias of varying etiology (7), in hemorrhage (5), burns (8), heat strokes and heat exhaustion (9), in utero-placental damage (10), allergies, histamine intoxications (11), sulfonamide intoxications (12), in acidosis, alkalosis, dehydration states, in excess vomiting and diarrheas, in diffuse hepatocellular damage, (hepato-renal syndrome), in conditions of excess protein catabolism, in vascular occlusions (4), intestinal strangulation, obstruction, perforation and fistulae, in peritonitis (5), in radiation and sun burn (13), in freezing, extensive surgical intervention, diabetic coma, Addison's disease, acute pancreatitis, cerebral lesions, thyroid crises, reflex anurias (4), etc. This list is certainly not complete but serves to demonstrate the ubiquity of the syndrome, and the need of watchfulness for its occurrence.

A common denominator in such diverse conditions is difficult of determination, and probably non-existent. However, certain mechanisms play an etiologic role so frequently that they may be considered fundamental. It should be understood that rarely is only one mechanism opera-

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tive. More often, as will be later elucidated, a combination of mechanisms occurs. The sequence of their appearance, their intensity and their duration is of importance. A thorough knowledge of these factors in the pathologic physiology, and an awareness of their possible occurrence in disease states will often, by means of our ever increasing therapeutic armamentarium, prevent death. Early, the lower nephron syndrome is reversible. Later the mortality rate is close to total.

The most commonly met mechanisms, alone or in combination are: 1. Shock; 2. Hemoglobinurias; 3. Hemorrhage; 4. Liver damage; 5. Physicochemical alterations in the blood, leading to acidosis, alkalosis, dehydration; 6. Increase in protein catabolism; 7. Local renal disturbances.

1. Shock

Kidney lesions and the clinical picture of the lower nephron syndrome have been described in shock notably by Moon and his associates. The kidney lesion will be described later. Suffice it to say now that the lesions are present mainly in the tubules which show varying degrees of degeneration of their cells, from cloudy swelling to complete destruction (13). The pathogenesis of the lesion may now be discussed.

Several theories have been maintained. It has been suggested that the hypotension present in shock reduces the effective filtration pressure in the glomeruli and diminishes peritubular circulation, with resultant anoxia. It has been shown that in shock, when circulating blood volume is reduced to 1/2 of normal, kidney circulation may be reduced to 1/10th, 1/20th or even less (14). The role of anoxia is here apparent.

Nephrotoxic substances arising from injured tissue have also been implicated. These substances may injure the kidney during their excretion. Many substances have been mentioned, but the particular agent is unknown. Adenosine triphosphate has been isolated from ischemic muscle and has been shown to be nephrotoxic. Other nephrotoxic substances have been isolated in blood returning from ischemic muscles, but cannot be isolated from normal muscles (15). Corcoran and Page have demonstrated a renal vasoconstrictor present in the plasma of shocked animals and humans (16).

An increase in viscosity of the blood (hemoconcentration) is another probable factor in the production of oliguria in shock (4). It limits the fluid available for excretory functions, increases protein catabolism, diminishes flow through the kidney and increases colloid osmotic pressure in the blood, thereby hindering filtration.

2. Hemoglobinurias

These conditions, following intravascular hemolysis after transfusions, black water fever, paroxysmal hemoglobinurias, etc., and myohemoglobinurias occurring in the crush syndrome, present a rather special problem. The crush syndrome first mentioned in the German literature after World War I, was rediscovered by Bywaters in crush victims during the London blitz in World War II. The mechanism whereby these conditions produce oliguria and azotemia is not entirely clear. It is true that in these conditions especially (but in other conditions initiating the lower nephron syndrome as well) there are precipitated in the lower nephron pigmented casts which block the tubules (17). At one time, it was considered that this caused the oliguria. It has been shown, however, that in most cases only 20% of the tubules are plugged. Eighty per cent of kidney tissue can normally carry on, however. It has also been demonstrated that it is improbable that hemoglobin or myoglobin casts would be precipitated unless there were previously damage to the tubule. Corcoran and Page state that oliguria and aciduria are necessary forerunners of hemoglobin precipitation in the renal tubule (16). It has been shown, however, that products of hemoglobin degradation have an intense renal vasoconstrictive effect (18).

It seems then that hemoglobinuria or myohemoglobinuria alone do not produce the lower nephron syndrome. Other factors present often are shock and anemia which damage the tubule. To this damage, hemo- or mychemoglobin, or their degradation products add further insult.

3. Hemorrhage

Hemorrhage produces its effects in the kidney by many of the mechanisms concerned in shock —hypotension, decreased circulation through the kidney, and by secondary shock itself. Basically the mechanism again seems to be anoxia, either by itself or in combination with other factors. In gastro-intestinal hemorrhage, there may be

the superadded factor of the digestion of massive amounts of blood, with resulting increase in the blood of protein derivatives which a damaged kidney cannot immediately excrete.

4. Liver damage

Increase in N.P.N. of the blood has often been described in diffuse hepato-cellular damage. The liver is the site of the deaminization of amino acids, and the production of urea. It has been shown that the increase in N.P.N. often is due to a rise in amino-acids, rather than in urea nitrogen. In some cases decrease and even absence of urea nitrogen has been demonstrated (4). It may be that a differentiation between the azotemia of the lower nephron syndrome in hepatic damage and that due to a failure of deaminization can be made by studing the partition of the N.P.N. into amino-acid and urea nitrogen. The factors of dehydration, hypotension, etc., in cases of severe hepatic damage have not been sufficiently stressed in the literature of the hepato-renal syndrome.

5. Physico-chemical alterations in the blood

Such changes are found in many of the conditions associated with the lower nephron syndrome, as well as those associated with so-called extra-renal syndrome. The exact mechanism whereby these alterations cause renal damage is conjectural. It has been shown that hypochloremia per se has little renal effect, but that the oft concommitant dehydration is a factor. Hyponatremia, on the other hand, produces a diminished blood volume, and is therefore causative, again by means of dehydration (4). Acid metabolites, such as lactate and phosphate from the destruction of tissues cause a decrease in alkali reserve, dehydration and an acid urine (16). Lately, the role of excess potassium, which may be toxic to the kidney, has been discussed. It should be remembered that K, in excess amounts, is released whenever large numbers of cells are destroyed. In severe dehydration, when intra-cellular fluids as well as extra-cellular fluids are drawn into the serum (as in diabetic acidosis), serum K also rises and may be a factor in renal and other damage (19).

6. Increase in Protein Catabolism

Increased protein catabolism is readily apparent in such conditions as destruction of muscle masses, absorption of hemorrhage and exudates, and large necrotic areas, burns, etc. Azotemia here depends upon the inability of the kidney to eliminate nitrogen wastes. This inability is augmented by other factors which decrease renal function, as mentioned above, and in burns especially by intra-vascular hemolysis and shock.

Less apparent is the increase in protein catabolism produced by dehydration per se by septic inflammations such as pleurisy, pneumonia, peritonitis, severe surgical trauma, tissue injury in allergic states, starvation, hyperthyroidism, fever and certain drug intoxications and sensitivities.

All of these factors are by themselves incapable of producing a significant degree of nitrogenous retention. They are, however, contributory, and interrelated with other mechanisms initiating the lower nephron syndrome.

7. Local Renal Disturbances

It is evident that the vascular system of the kidney and even the tubules themselves are under the control of nervous and humoral factors. The role of reflex anuria from stimulation of the splanchnics is still not completely understood. Reflex anuria in the well kidney from pathology in the other diseased kidney is of relatively common occurrence. Reflex anuria from operations distant from the genito-urinary tract may occur, as well as hysteric anurias and anurias following cerebral lesions.

The adrenal cortical hormones affect, by action on the tubules, sodium excretion and perhaps also urea excretion. The posterior pituitary hormone increases reabsorption of water by the tubule. Thryroxine is antagonistic to the posterior pituitary in this instance. The parathyroid hormone lowers the renal threshold for phosphate. The possible role of these factors in the lower nephron syndrome needs further investigation (20).

Another local mechanism of import to be mentioned, is venous stasis in the kidney, from heart failure.

In a review of these basic mechanisms, it seems to me that the ultimate factor is probably anoxia, whether from vasoconstriction, hypotension, or other more basic mechanisms.

Pathology

There is a need for categorization of our knowledge of the pathology of extra-renal azotemia and/or the lower nephron syndrome. In a review of the pathology as described in studies by

various authors, Moon confirms the following pathologic picture (13).

Grossly, the kidneys are normal in size or moderately enlarged and edematous. The capsule strips easily, the stellate veins in the cortex are engorged. The color varies depending upon the degrees of hyperemia and parenchymatous change. Hemorrhagic streaks are seen in the medulla and the cortical markings are obscured. Petechiae may be seen in the parenchyma and in the pelvic lining.

Microscopically, Moon states, there are varying degrees of changes within a regular pattern. He describes hyperemia of the glomerular tufts and of the intertubular vessels and sometimes capillary hemorrhage. Amorphous material is seen in the capsular spaces. He describes degenerative changes in the convoluted tubules ranging from cloudy swelling to necrosis. He locates the changes as being "usually more pronounced in the upper segment, sometimes in the lower, but in general all portions of the convoluted tubules are affected." He describes hyaline, granular and often (but almost always in hemoglobinuria and burns) pigmented casts in the lower nephron. Debris, red cells and desquamated epithelial cells are present in the collecting tubules. The amount of edema varies.

Martineau and Hartman (8) describe very much the same picture in 20 cases of human burns. They locate the pathology in the proximal convolution and the ascending thick segment of Henle's loop. They also describe vacuolar and hydropic degeneration, and necrosis in the collecting tubules.

Corcoran and Page (16) describe hydronephrosis of nephrons and groups of nephrons due to casts. This condition is present in an insufficient number of nephrons to cause the clinical oliguria.

Bell and Knutson (1) differentiate a true extrarenal azotemia from an azotemia due to tubular injury. They describe cases of azotemia in dehydration states, in post-operative cases and in conditions of hypotension of which only 23% showed tubular damage on post-mortem examination. The cases in this study were all preterminal. Bell and Knutson admit that functional lesions may occur which are not microscopically demonstrable.

According to Lucke (2), the lesions in all cases are "essentially the same, degeneration, often necrosis, limited to the distal segments of the tubules, with brown casts of some heme compound in the distal segments and collecting tubules." In all cases described by Lucke, the pathology was described as minimal or nonexistent in the glomeruli, proximal convoluted tubules and intermediate segments. Lucke quotes references for such selective damage in the reported pathology in crush injury, burns, incompatible blood transfusions, in utero-placental damage, in sulfonamide intoxication and after excess vomiting. In these cases, at least, the lower nephron syndrome is a correct appellation.

Malamud (9) et al., in a study of renal lesions in fatal heat stroke, also concur with Lucke in the localization of the pathology to the distal segment.

I have tried in this review of the pathology to show the major points of disagreement.

Clinical Picture

The symptoms of the lower nephron syndrome are always super-added to those of the initiating disease. The chief features seem to be fatigue, drowsiness progressing into stupor, and coma. The usual clinical manifestations of renal uremia such as dehydration, anemia, pallor, pericarditis, diarrhea, are rarely seen, probably because of the short duration of the disease. Muscular twitchings were present in one case, and uremic frost in another of Jaghers and Bakst. Vomiting is frequent according to Lucke. Convulsions are uncommon.

Oliguria is of constant occurrence, and often proceeds to anuria. The oliguria is usually noted in the first 24 hours, and persists despite a large intake of fluids and other measures to restore elimination. Urine output is usually less than 500 c.c. daily.

The urine is dark, sometimes smoky or frankly bloody, contains albumin, hemoglobin, debris, erythrocytes or shadow cells, hyaline, pigmented and granular casts even when there has been no known hemolysis.

The hemoglobinuria is usually transitory, lasting only one or two days. The albuminuria, however, usually persists through the disease and maybe longer.

The specific gravity of the urine has been variously described. Lucke (2) states it to be low. However, many case reports show a high specific

gravity. Mallory believes a fixed specific gravity is of high diagnostic import (21).

The mechanism of oliguria has been variously ascribed. That it is not due to tubular blockage is now generally agreed. A decreased renal circulation at a lowered pressure, does play a part, but cases have been described where no such mechanics were operative. It is now considered that the chief cause of oliguria is an almost complete and non-selective reabsorption of the glomerular filtrate by the damaged tubule (22). Actual visual observation of the nephron of a frog, whose tubules were poisoned with bichloride of mercury, showed active and even increased glomerular filtration in the presence of anuria. Rupture of damaged tubules may aid in the process (23).

In all cases the blood shows a rapid rise in N.P.N. and by the third day, the N.P.N. may exceed 150 mg. %. Urea N usually rises proportionately, except, as previously mentioned, in certain cases of hepato-cellular necrosis. The creatinine usually rises in proportion, but I have seen cases of extra-renal azotemia where the creatinine remains low. Bell (1) states differentiation of renal from non-renal azotemia by creatinine determination is of no value.

In some cases a high potassium and phosphate level in the blood has been reported, as has also a decrease in alkali reserve.

The physical findings consist of some slight to moderate edema. Acute pulmonary edema may arise and is of grave import. Edema of the face is uncommon.

Hypertension is one of the cardinal signs of lower nephron syndrome according to Lucke (2) and to Mallory (21). After shock, the blood pressure rises to 150/90 or higher and is maintained during the disease.

Mortality rate

The mortality rate, once the condition is well established, is inordinately high. Lucke (2) reports an 90% mortality rate, 74% of these cases dying in the first eight days. The mortality rate in crush syndrome as reported by Bauer (24) is also 90%. The course is usually brief (3-10 days) in fatal transfusions.

Treatment

The treatment for the lower nephron syndrome should be as far as possible prophylactic. This means prompt and adequate therapy of shock, hemorrhage, electrolyte imbalance, whenever these may and do occur. Blood matching must utilize all the newer knowledge of subgroups and the various Rh. factors. The treatment of diffuse liver damage and Addison's disease has been well elaborated and needs no discussion here. Alleviation of intestinal obstruction before electrolyte shifts, the immediate and adequate therapy of burns to prevent loss of protein, and the constant attention to urine output, urinalysis, and blood chemistry, may bring earlier diagnosis and more successful treatment.

Once tubular damage has occurred, possible reversibility must be considered, and immedate attention given to azotemia.

Specific etiologic factors in the lower nephron syndrome may require special treatment.

In the crush syndrome, Corcoran and Page (16) suggest immediate bandaging of the limb to prevent sudden overwhelming absorption of toxic products. They also recommend the immediate use of intravenous diuretics such as 5-10 grams of sucrose, or 1 gram of sodium sulfate, together with 1-2 liters of sixth molar lactate solution.

Alkalinization has been recommended where myo- or hemoglobinuria are expected, but dangers of excess alkalinization after kidney damage have been stressed by English writers studying blackwater fever (25).

Renal decapsulation has been suggested, and described by various authors. It is not clear that, in a possibly reversible condition such as lower nephron syndrome, decapsulation is always responsible for reported improvement.

Cases of relief by splanchnic block, high spinal or caudal anesthesia have been reported (26) (27). A physiologic basis for such therapy is provided by the work of Franklin and his colleagues in England (28).

New hope has arisen from the use of peritoneal lavage (29) in which for a time, the peritoneum is made to act as a dialyzing membrane to remove nitrogenous wastes, giving the tubules time to regenerate.

Another method of temporizing until repair may occur consists of diluting the toxic products in the blood by adding 1-2 liters of salt solution to other intravenous therapy in order to produce edema. This is necessarily a dangerous procedure for fear of pulmonary edema, and a careful

and constant check on the lung must be done (30).

Summary

The etiology, pathogenesis, pathologic physiology, clinical manifestations, and therapy of the lower nephron syndrome has been presented. It is hoped that with sufficient emphasis to physicians in all fields of medicine, the syndrome will be expected in various disease states, earlier recognized and earlier treated, in order that prevention or reversal of an otherwise highly fatal syndrome be accomplished.

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REFERENCES

(1) Bell, E. T. and Knutson, Robert C.: "Extrarenal Azotemia and Tubular Disease," J.A.M.A. 134, 441-446 (May 31) 1947.

(2) Lucke, B.: "Lower Nephron Nephrosis: The Renal Lesions of the Crush Syndrome, of Burns, Transfusions and Other Conditions Affecting the Lower Segment of the Nephron," Mil. Surgeon 99:371 (Nov) 1946.

(3) Cumin, W.: "Cases of Severe Burn, with Dissection and Remarks," Edinburgh M. and S. J. 19:337-344, 1923.

(4) Jeghers, H., and Bakst, H. J.: "The Syndrome of Extrarenal Azotemia," Ann. Int. Med. 11:1861, 1938.

(5) Moon, V. H.: "Shock, Dynamics, Occurrence and Management," Philadelphia, Lea and Febiger, 1942. Chap. 9 and 15.

(6) Bywaters, E. G. L., and Beall, D.: "Crush Injuries with Impariment of Renal Function," Brit. M. J. 1:427, 1940.

(7) Foy, H.; Altman, A.; Barnes, H. D. and Kondi, A.: "Anurea, with Special Reference to Renal Failure in Blackwater Fever, Incompatible Transfusions, and Crush Injuries," Tr. Roy. Soc. Trop. Med and Hyg. 36:197, 1943.
Ross, J. F.: "Hemoglobinemia and Hemoglobinureas," New England J. Med. 233:691, 732, and 766, 1945.

(8) Martineau, P. C., and Hartman, F. W.:"The Renal Lesions in Extensive Cutaneous Burns," J.A.M.A. 134, 429 (May 31) 1947.

(9) Malamud, Nathan, et al.: "Heat Stroke, a Clinico-Pathologic Study of 125 Fatal Cases," Mil. Surgeon 99:397 (November) 1946.

(10) Paxson, N. F., Golub, L. J., and Hunter, R. M.: "Crush Syndrome in Obstetrics and Gynecology," J.A.M.A. 131:500-504, 1946.

(11) Rackemann, F. M., Longcope, W. T., and Peters, J. P.: "The Excretion of Chlorides and Water, and the Renal Function in Serum Disease," Arch. Int. Med., 18: 496-504, 1916.
Longcope, W. T., and Rackmann, F. M.: "Severe Renal Insufficiency, Associated with Attacks of Urticaria, in Hypersensitive Individuals," Jr. Urol. 1:351-366, 1917.

(12) Luetscher, J. A., Jr., Blackman, S. S., Jr.: "Severe Injury to Kidneys and Brain Following Sulfathiazole Administration: High Serum Sodium and Chloride Levels and Persistent Cerebral Damage," Ann. Int. Med. 18:741-756, 1943.

(13) Moon, V. H.: "Renal Deficiency Associated with Shock," J.A.M.A. 134, 425, (May 31) 1947.

(14) Richards, D. W., Jr.: "Circulation in Tramatic Shock in Man." Harvey Lectures, February 17, 1944.

(15) Stoner, H. B., and Green, H. N.: "Adenosine Compounds, and Phosphates in the Blood of Shocked Rabits," J. Path. and Bact. 66:343-354, 1944.

(16) Corcoran, A. C., and Page, Irvine H.: "Crush Synrome: Post Traumatic Anurea," J.A.M.A. 134, 436 (May 31) 1947.

(17) Baker, S. L., and Dodds, E. C.: "Obstruction of the Renal Tubules during Excretion of Haemoglobin," Brit. J. Exper. Path. 6:247-260, 1925.

(18) Corcoran, A. C., and Page, I. H.: "Renal Damage from Ferroheme Pigments, Myoglobin, Hemoglobin, Hematin," Texas Rep. Biol. and Med. 3:528-544, 1945.

(19) Birnbaum, W.: "Crushing Injuries with Renal Failure," California and West. Med. 64:15-18, 1946.

(20) Best, C. H., and Taylor, N. B.: "Physiologic Basis of Medical Practice," Baltimore, Williams and Wilkins, 1945. p. 385.

(21) Mallory, T. B.: "Hemoglobinuric Nephrosis in Traumatic Shock," Am. J. of Clinical Pathology, Vol 17: p. 427, (June) 1947.

(22) Dunn, S. J., Gillespie, M., and Niven, J. S. F.: "Renal Lesions in 2 Cases of Crush Syndrome," Lancet 2: 549-552, 1941.
Dunn, J. S., Haworth, A., and Jones, N. A.: "Pathology of Oxalate Nephritis," J. Path. and Bact. 27:299-318, 1924.

(23) Richards, A. N.: "Direct Observations of Change in Function of the Renal Tubule Caused by Certain Poisons," Tr. A. Am. Physicians 44:64-67, 1929.

(24) Bauer, F.: Correspondence. J.A.M.A. 134, July 5) 1947. p. 914.

(25) Maegraith, B. G., and Havard, R. E.: "Dangers of Intensive Alkali Treatment in Blackwater Fever," Lancet 2:338, 1944.

(26) Williams, M. H. C.: "Treatment of Weil's Disease by Spinal Anesthesia," Lancet 1:89-124, (Jan. 18) 1947.

(27) Peters, H. Raymond: "Anurea Following Hemolytic Reaction to Blood Transfusion: Recovery Following Splanchnic Block," Ann. Int. Med. 16:547 (March) 1942.

(28) Franklin, K. J., et al.: "Renal Pathology in the Light of Recent Neurovascular Studies," Lancet 2:239, 1946.

(29) Seligman, A. M., Frank, H., and Fine, J.: "Treatment of Experimental Uremia by Means of Peritoneal Irrigation," J. Clin. Investigation 25:211, 1946.

(30) Hoffman, W. S.: Personal Communication.

ELECTROMYOGRAPHIC STUDIES IN HUMAN LOCOMOTION*

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THE recording of the electrical manifestations of muscular activity is one of the most objective and reliable methods for the study of muscle function, and yields very valuable information regarding the status of various muscles in health and in disease. Electromyographic studies of patients suffering from poliomyelitis and from various forms of primary muscle dystrophies was started at the University of Milano, about ten years ago. The early observations were made with various types of galvanometers and oscillometers, but it soon became apparent that the cathode-ray oscillograph is the best instrument for the faithful recording of the electrical activity of muscle and makes it possible to obtain records undistorted by inertia and without the loss or summation of frequencies.

The action currents of the muscle under investigation were picked up by a needle electrode inserted into the muscle and connected to the oscillograph through a number of amplifying stages. The movements of the oscillographic beam were photographed on revolving paper during the performance of a definite movement following a command given by the investigator. In many cases the oscillographic observation was supplemented by the study of muscle biopsies (Fig. 1). These studies gave us valuable information on the degree of muscle damage and

Case M. G. Poliomyelitis 10 years before
Upper: Healthy quadriceps. Biopsy; x 240.
Lower: Electromyogram of the healthy quadriceps.
Upper: Paralytic quadriceps. Biopsy; x 240
Lower: Electromyogram of the paralytic quadriceps.

FIGURE 1

*Lecture delivered at The Chicago Medical School Seminar on January 21, 1948.

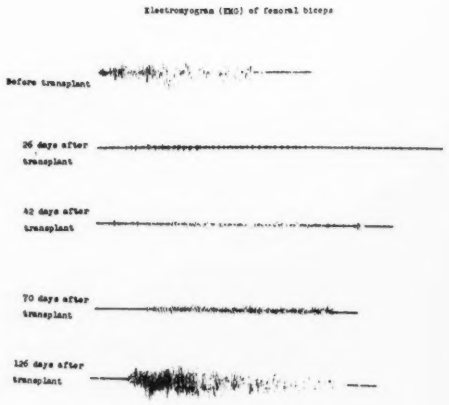

FIGURE 2

functional loss, permitted us to follow the process of recovery, both spontaneous and following various forms of treatment, and to study the adaptation of muscles to new anatomical positions and functions after the transplant of their distal tendons (Fig. 2).

When the transplant is made for the purpose of enabling the patient to perform isolated and fully conscious movements, the return of normal electrical activity usually corresponds with satisfactory kinetic results. This is ordinarily the case for the upper limb. However, this not the case when one wishes to restore a semi-automatic and complex function, such as that of walking. Very often a muscle of the leg transplanted to a new position shows excellent electrical recovery, corresponding with the ability to perform the particular movement for which the transplant was designed, but the function of walking does not return. The patient can take a few well studied steps, but soon tires and stumbles, without ever gaining full automatism.

This failure of the transplanted muscle to perform a movement in coordination with others suggested the existence of a different mechanism of action between the isolated and the coordinated movement and offered a possible explanation for the none-too-infrequent failure of a perfectly executed transplant to restore the ability to walk. It became, therefore, necessary to

investigate the entire kinetics of human locomotion rather than the isolated movement. We are indebted to Dr. Richard Scherb of Zurich for having applied the use of the treadmill to this type of investigation. As the patient walks on the treadmill without changing its position relative to the observer, a record of the various phases of the step is obtained by means of a specially constructed sandal with three electrical contacts under the heel, the head of the third and the head of the fifth metatarsal, respectively.

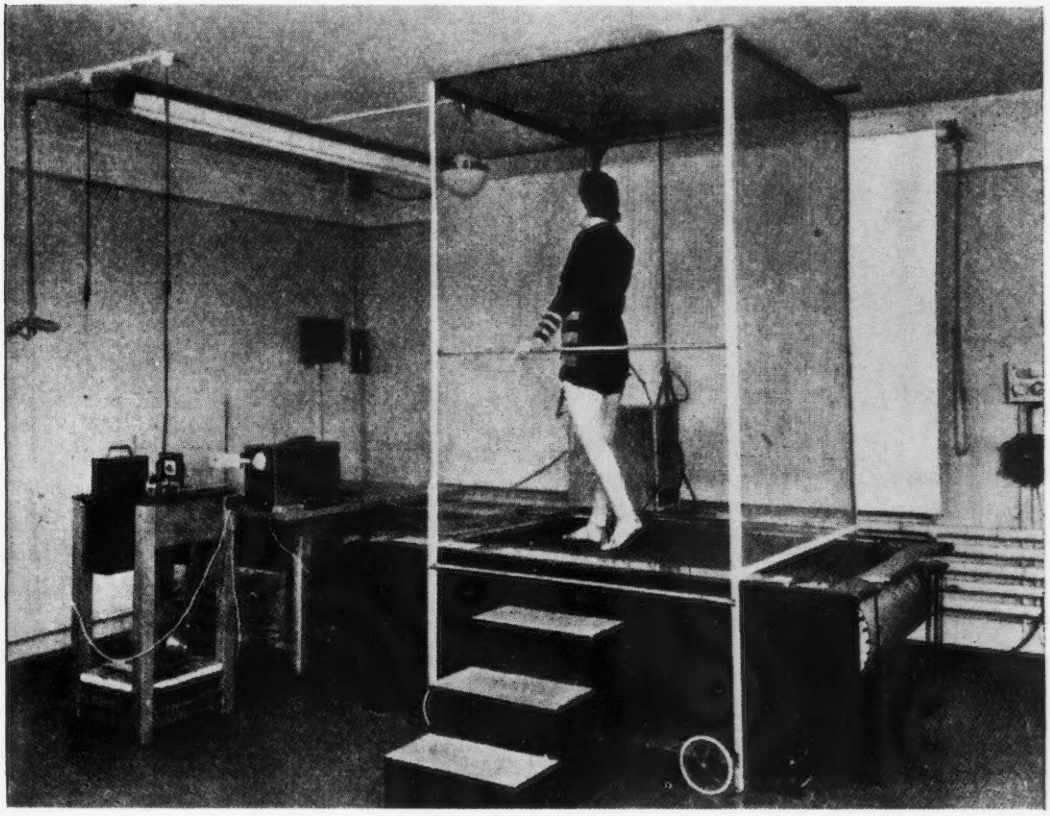

FIGURE 3

As the subject walks, the light of three electric bulbs is observed, and the contact is recorded by three writing signal magnets. This podogram is then transposed on the record of the duration and intensity of the contraction of various muscles obtained by manual palpation, during the march. Scherb called this technic myokinetography, or the analysis of locomotor kinetics. Although very interesting results were obtained in this fashion, the correct palpation of muscles required a great deal of experience and was too subjective, and, furthermore, it was difficult to synchronize the podogram with the record of muscular activity. The electromyogram was, therefore, substituted for the manual palpation and the lights of the podogram recorded simultaneously on the same strip of photographic paper. This method is relatively simple, objective, and has the added advantage that the number of muscles which can be studied simultaneously is limited only by the number of circuits available. (Figures 3, 4, 5 and 6.)

We studied 117 muscles of the pelvic and lower limb in 14 normal individuals and several dozen muscles in cases of polio, primary dystrophies, toxic paresis and other diseases. The work was done in Dr. Scherb's Department and I am grateful to him for his generous hospitality. Our results have fully confirmed the manual observa-

tions of Scherb and have further pointed out some aspects of muscle kinetics which could not have been predicted on the basis of our anatomical and physiological knowledge and which have explained, at least in part, some of the surgical failure to which I have referred.

It appears that each muscle, when working synergistically or antagonistically with others during the complex process of walking has a kinetic identity and that its action is often different and in apparent contrast with the action of the same muscle during its isolated contraction.

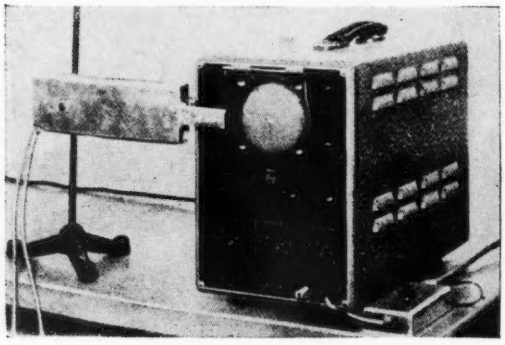

FIGURE 4

This new concept of kinetic identity of the muscles may become the basis for a new classification different from that based on purely anatomical data. A few examples will clarify this point. The semi-tendinosus and semi-membranosus muscles are usually described as flexors of the leg on the thigh and they are in the isolated, conscious movements, such as that following a command. However, during the complex, coordinated and semi-automatic movement of walking,

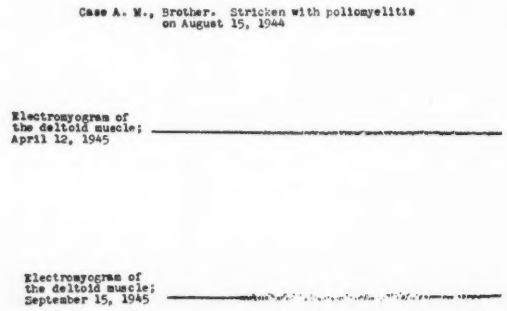
Case A. M., Brother. Stricken with poliomyelitis on August 15, 1944
Electromyogram of the deltoid muscle; April 12, 1945
Electromyogram of the deltoid muscle; September 15, 1945

FIGURE 5

Case R. M., Sister. Stricken with poliomyelitis on August 15, 1944
Electromyogram of the deltoid muscle; April 12, 1945
Electromyogram of the deltoid muscle; September 15, 1945

FIGURE 6

they behave in a different way: the semi-tendinosus acts during the oscillatory phase of the step, and is mainly a flexor, whereas, the semimembranosus acts during the standing phase, and is prevalently an extensor (Fig. 7). The femoral biceps is composed of a long and a short head fused in a single distal tendon. During the isolated movement, both heads act simultaneously as flexors, while during the march, the short head works in the phase of oscillation as a pure flexor and the long head during the standing phase, almost entirely as an extensor (Fig. 8). This discrepancy between the function predicted by the anatomical observation, and that

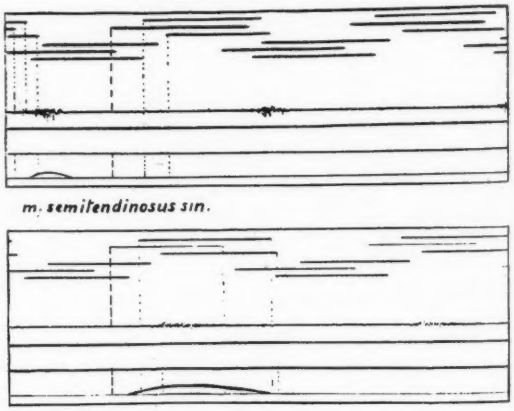

FIGURE 7. ELECTROMYOGRAM OF THE LEFT SEMITENDINOSUS AND OF THE LEFT SEMIMEMBRANOSUS MUSCLES. The 3 parallel lines of the podogram represent the time of contact of the 3 electric signals. Sin. = left. The curve at the bottom of each record is the myogram obtained by manual palpation.

found in reality is more apparent than real and can be easily explained. One must only think that the function of marching is associated with

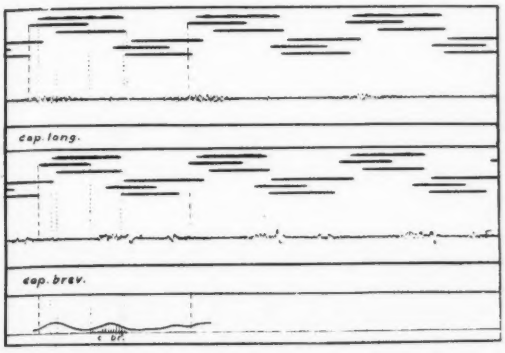

FIGURE 8. **ELECTROMYOGRAM OF THE LEFT FEMORAL BICEPS. Compare with the upper (left) podogram. Symbols as in Figure 7.**

continuous changes in the reciprocal relationship of the various parts of the skeletal segments and of the various muscles to each other. In the alternating of the phases of swinging, standing, and double standing, there is a continuous change in the relative position of forces, resistances, and fulcrums. The same muscle may have one action when the limb is extended and an entirely different one when the femur and the tibia are at an angle to each other.

It is apparent that this discrepancy between the action of a muscle during its isolated contraction and that of the same muscle during the normal semi-automatic and co-ordinated contraction becomes extremely important for the proper choice of muscles to be transplanted for vicarious function. This does not apply, as a rule, to the muscles of the upper limb, which ordinarily perform voluntary and full conscious movements, but the problem becomes acute in the case of the lower limb if one desires to restore the automatism of walking. In the light of the present knowledge, we cannot justifiably transplant muscles of the leg without considering the laws of kinetics of locomotion.

The electromyographic observation has also revealed that the action of a complex muscle, such as the femoral biceps, or the triceps, or the femoral quadriceps, is the result of the activity of the individual components of the muscle, which contract sometimes synergistically, sometimes not, and which do not always contract simultaneously and for the same length of time (Fig. 8). Even within the individual muscle, the fibers do not contract simultaneously, but the movement propagates like a wave from one group of fibers to the other in a very logical fashion from the standpoint of function. In the case of the gluteal muscles, for instance, the movement propagates from the gluteus maximus to the medius, to the tensor fasciae latae and from the posterior to the anterior fibers (Fig. 9). This phenomenon had already been observed by Scherb by means of manual palpation and had been called by him the Facher Symptom or the Fan Phenomenon. It constitutes a good test for the differential diagnosis of various muscle diseases: it is maintained, even though quantitatively reduced, in the non-affected fibers of a muscle stricken with poliomyelitis, whereas, it disappears in muscles affected by spastic and cerebral palsies. The latter contract massively and simultaneously in all their parts.

By means of electromyographic studies, it is also possible to follow the recovery of function of muscles stricken by poliomyelitis, detect the time at which this spontaneous recovery has reached its maximum as well as the time most suitable for surgery. It is possible, as stated above, to select the muscle most suited for trans-

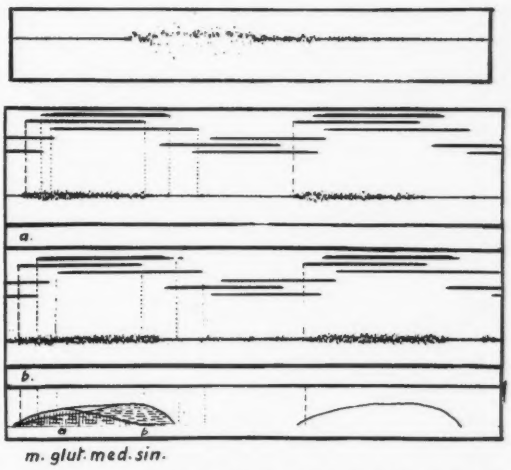

FIGURE 9. **ELECTROMYOGRAM OF THE LEFT GLUTEUS MEDIUS. Upper tracing obtained during the isolated contraction. Symbols as in Figure 7.**

plantation, ascertain its viability and follow its process of adaptation to the vicarious function (Fig. 2).

A final observation of interest, which came out of these studies, is that a muscle performing an isolated movement on command, does it with a much greater expenditure of energy than when the same movement is performed during the march. It appears that the natural, semi-automatic movement is achieved with the greatest possible economy (Fig. 9).

SEMINARS

Schedule of meetings and lectures to be held during the Spring and Summer Quarters of 1948 on Wednesday at 1:00 P.M., in Amphitheater A. Students, faculty, and guests are invited.

April 7—Anatomy Research Seminar: "The Production of Human Laryngeal Pitch." Dr. L. H. Strong, Associate Professor of Anatomy, The Chicago Medical School.

April 14—Physiology Research Seminar: "The Body Temperature — Blood Pressure Relationship." Dr. S. Rodbard, Assistant Director of Cardiovascular Research, Michael Reese Hospital.

April 28—Surgery Journal Club: "Gastro-Intestinal Malignancy." Dr. E. A. Christofferson, Professor and Chairman of the Department of Surgery, The Chicago Medical School.

May 5—"Changes in the Behavior of Cancer Cells." Dr. E. V. Cowdry, Professor of Anatomy, Washington University, and Director of Research, Barnard Free Skin and Cancer Hospital, St. Louis.

May 12—Anatomy Journal Club: "Two Recent Physical Aids in Microscopy." Dr. H. Fish, Assistant Professor of Microscopic Anatomy, The Chicago Medical School.

May 26—"Recent Advances in Chemotherapy of Parasitic Diseases." Dr. L. T. Coggeshall, Professor and Head of the Department of Medicine, Dean of the Division of the Biological Sciences, The University of Chicago.

June 2—"Problems in the Development of the Lymphatics." Dr. O. F. Kampmeier, Professor and Chairman of Department of Anatomy, University of Illinois.

June 9—Medicine Research Seminar: "Disturbances of the Regulation of Body Weight." Dr. H. Rony, Associate Professor of Clinical Medicine, The Chicago Medical School.

July 14—"Adrenergic Blocking Agents." Dr. Earl R. Loew, Associate Professor of Pharmacology, The University of Illinois, College of Medicine.

July 21—"The Pathology of Gastric Carcinoma." Dr. Benjamin H. Neiman, Assistant Professor of Pathology, The Chicago Medical School.

July 28—"The Role of Psychiatry Today." Dr. Rudolph Dreikurs, Professor of Psychiatry, The Chicago Medical School.

August 4—"The Value of Skin Tests in Occupational Diseases of the Skin." Dr. Maurice Oppenheim, Professor and Chairman of the Department of Dermatology and Syphilology, The Chicago Medical School.

August 11—"The Present Status of Viruses and Virus Diseases." Dr. H. J. Shaughnessy, Chief, Division of Laboratories, Illinois State Department of Health.

August 18—"The Broncho-vascular Pattern of the Lung in Relation to Thoracic Surgery." Dr. Saul A. Mackler, Assistant Professor of Thoracic Surgery, The Chicago Medical School.

August 25—"Cancer as a Gynecologic Problem." Dr. Egon W. Fischmann, Professor and Chairman of the Department of Obstetrics and Gynecology, The Chicago Medical School.

September 1—"The Tiselius Apparatus, Its Application in Biochemistry and Medicine." Dr. A. Robert Goldfarb, Instructor in Biochemistry, The Chicago Medical School.

September 8—"Recent Studies in Hypertension." Dr. George E. Wakerlin, Professor and Chairman of the Department of Physiology, The University of Illinois, College of Medicine.

PSEUDO-GLANDULAR DISTURBANCES

HUGO R. RONY, M.D., F.A.C.P.*

A FEW years ago, Fuller Albright and his collaborators (1) described a clinical picture which was characterized by signs and laboratory findings typical for parathyroid deficiency but was due, in their opinion, to failure of the body tissues to respond to the parathyroid hormone rather than to failure in the production of the hormone. They named this condition "pseudo-hypoparathyroidism — an example of Seabright-Bantam syndrome," and mentioned two other anomalies of similar nature, i.e., failure of an end-organ to respond normally to a hormone: the absence of beard in the American Indian and low basal metabolic rates in patients without evidence of hypothyroidism.

The term "Seabright-Bantam syndrome" was invented by Albright on basis of the fact that the male Seabright Bantam — a variety of fowl — has female feathering, and of his assumption that "the cause of this abnormality is not that the testis of the male bird produces female hormone but that the feathers of the male bird respond in an abnormal way to the normal male hormone." However, T. H. Morgan who made careful studies of this phenomenon came to a different conclusion (2). He found that the normal ovary of the female of this fowl secretes some substance that holds in check the development of male plumage, and produced evidence to show that the testis of the normal male bird also produces this or a similar substance. This would indicate that the female feathering in the male bird is a specific hormonal effect in this species and is not due to failure of the end-organ to respond. Therefore, it is hardly appropriate to apply the term "Seabright Bantam syndrome" for cases of end-organ failure.

In this paper we wish to call attention to still other types of abnormal end-organ response. There is no doubt that end-organ response is a variable element in every hormonal action and that, in effect, hormonal action in general depends on the level of end-organ sensitiveness as well as on the amount of the hormone. It is probably safe to say that variations of hormone effects within normal limits — such as normal variations in basal metabolic rate, skeletal growth, size of breasts, amount of body hair, etc. — are due to variations in end-organ sensitiveness rather than to variations in the amount of the hormones produced. Increased as well as decreased variants of end-organ sensitiveness occur, i.e., the end-organ may be more sensitive in some individuals and less sensitive in others than the average. Abnormally low levels of end-organ sensitiveness to a hormone would result in clinical pictures of pseudo-glandular deficiency, while abnormally high levels of end-organ sensitiveness to the hormone would result in pseudo-glandular hyperactivity. Such pictures are seen in medical practice quite frequently and are, therefore, of considerable practical importance; indeed, some types seem to be more common than the corresponding true lack or excess of the hormone. Failure to recognize a pseudo-glandular disturbance as such and differentiate it from the corresponding true glandular disturbance is apt to lead to confusion in the interpretation of physical and laboratory findings and to disappointments in hormonal therapy.

The obection may be raised that introduction of a new element, "end-organ sensitiveness," may not represent much progress in the understanding of these conditions, in that it means only a substitution of unknowns by another unknown. This objection is hardly justified. In the first place, the term "pseudo-glandular disturbance" carries the clear statement that it is not a glandular disturbance; this is in itself important. Secondly, the term "end-organ sensitiveness" directs attention to an element that has definite meaning, can be verified and can be made the subject of further study.

It may be added that abnormal end-organ response is not the only possible basis upon which a pseudo-glandular disturbance may develop. Thus a hormone, produced in normal amounts, might be destroyed in the blood by antihormones or in some other way, or it could accumulate in excessive amounts in the body because of failure to be eliminated or destroyed normally. There is some evidence that such processes may occur, but their clinical significance seems to be very limited at present.

DIFFERENTIAL DIAGNOSIS

At present some types of pseudo-glandular disturbances can be recognized readily, while in others differentiation from true glandular disturbance may be difficult and uncertain. In this effort the following points may be useful:

1. **Hormone assays.** Obviously, demonstration of lack or excessive amounts of a hormone by hormone assay is direct evidence of true glandular disturbance, while finding of normal amounts of hormone in the presence of signs that char-

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acteristically occur in glandular disturbances is suggestive for pseudo-glandular disturbance. However, at present only few of the hormones can be determined quantitatively in the blood or urine, and the methods require considerable technical facilities and training. Therefore, valuable as they are, hormone assays can be rarely resorted to in practical differential diagnosis.

2. **Physical examination of a gland.** Pathological changes in the size of a gland, demonstrated by X-ray or palpation, are more or less suggestive for true glandular disturbance, but the absence of such changes cannot be regarded as evidence for pseudo-glandular conditions. Much more decisive is the histological examination of the gland, by biopsy or necropsy, in that it may definitely indicate functional abnormality (true glandular) or normal efficiency (pseudo-glandular). Again, this test is rarely available for practical diagnosis.

3. **Response to administered hormone.** Proper administration of the hormone in question may relieve the deficiency sign or symptom—indicating true glandular disturbance with intact end-organ sensitiveness, while failure of the administered hormone to act in a normal fashion would suggest pseudo-glandular nature of the condition. This test, first suggested for this purpose by Albright, is frequently feasible and may be of considerable value.

4. **Solitary nature of the outstanding sign.** Some of the hormones are known to act on several different end-organs or end-tissues, e.g., the male sex hormone is instrumental in the development of the penis, scrotum, prostate gland, seminal vesicles, body hair follicles, vocal cords, etc. In true male hormone deficiency *all* these end-organs are affected, although not necessarily to the same extent. On the other hand, in male pseudo-hypogonadism due to end-organ hyposensitiveness, *one* end-organ only may be affected—for instance, diminutive penis in an otherwise thoroughly masculine man—in view of the fact that end-organ sensitiveness may be inherent in the anlage of a particular organ or tissue, and may be altered in one organ alone. Thus, the "solitary sign" represents strong evidence for end-organ anomaly, while the "complete picture" or "multiple signs" favor the diagnosis of true hormonal disturbance.

5. **Constitutional nature of end-organ anomalies.** Clinical experience indicates that pseudo-glandular disturbances are practically always inherited or congenital or both, and as such are frequently associated with other constitutional anomalies entirely unrelated to glandular functions. This feature has, of course, but limited value in differential diagnosis in view of the fact that true glandular disturbances, too, frequently are of constitutional nature. However, features indicating non-constitutional nature of the disturbance — such as appearance after a trauma or infection or emotional upset—could be regarded as strong evidences against end-organ anomaly.

In the following we shall list and briefly describe the more common forms of pseudo-glandular disturbances. It is realized that, in some of them, the interpretation that they may be due to anomalies in end-organ response, remains more or less hypothetical. They are included to stimulate interest and further study in this field.

(A) PSEUDO-THYROID DISTURBANCES

I. A condition that may be called **pseudo-hypothyroidism** is frequently seen by physicians who liberally use the basal metabolism test in cases of obesity, leanness, fatigue syndromes, etc. Characteristic findings are: (a) lowered basal metabolic rate; (b) absence of other signs of thyroid or other glandular deficiency; and (c) lack of response of the BMR to thyroid administration.

The BMR is usually between —20% and —25%, in occasional cases as low as —30%; there is little variation on repeated tests. On palpation the thyroid gland appears to be of normal size and consistency. There is no myxedema, the skin is not dry, there is no loss of hair, mental sluggishness, loss of memory, drowsiness, cold intolerance, or menstrual disturbance. The blood cholesterol is within normal limits. The pulse rate is normal or elevated. Many of these patients are obese or lean; some have normal weight. Tiredness and lack of endurance in physical effort is a common complaint. Some appear to be high-strung and nervous. Administration of small to moderate amounts of thyroid gland (one to four grains daily of the desiccated substance) has no definite effect on the BMR;

larger amounts (six to eight grains daily) may be followed by palpitation, rapid pulse, signs of increased nervousness, irritability and tremor with no or little change in the BMR.

M.P., an 18-year-old obese girl with no complaints other than overweight and fatigue, was observed in the hospital over a period of eleven weeks. She was kept on a high protein-low caloric diet, and lost 35 lbs. during this period. Fig. 1 shows the effect of administered thyroid substance on the pulse rate with negligable effect on the BMR. When thyroid administration was discontinued because of tachycardia, nervousness and tremor, the BMR still was —20%.

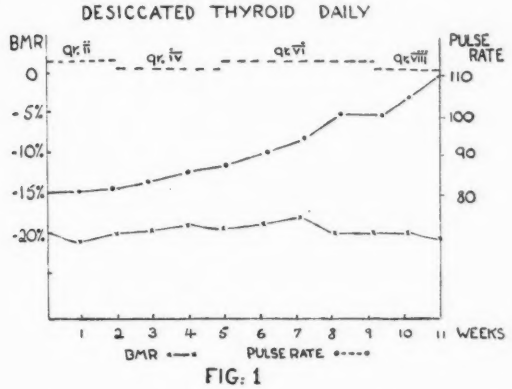

FIG. 1

J.W., 8-year-old boy. Main complaints: tiredness, lack of endurance, restlessness and nervousness. Height 55 inches, weight 68 lbs.—rather tall and underweight. Physical examination, blood count, urinalysis, X-ray films of the skull and hand: essentially negative. High I.Q. Pulse rate 86. BMR: —21%. Thyroid administration was tried, one grain being given daily for 4 weeks, followed by two grains daily for 4 weeks. Metabolism rates taken weekly ranged between —17% and —24% with no definite change in the pulse rate; however he became increasingly nervous and tired, and had even less endurance than before. Apparently, in this case, there was a marked dissociation in end-organ response to the thyroid hormone, tissue metabolism being insensitive, the central nervous system being highly sensitive.

Occasionally, obese individuals with low BMR are observed in whom lack of response to administered thyroid is not limited to the BMR but extends to all end-organs concerned: these subjects can take excessive amounts of thyroid substance (fifteen or more grains daily) for any length of time without significant elevation of the BMR and pulse rate, and without any toxic symptoms (3).

II. Even clinicians with large experience have occasionally great difficulty in differentiating a "hyperthyroid state," "mild thyrotoxicosis," "borderline hyperthyroidism," "forme fruste," etc., from "neurocirculatory asthenia" or some other disorder of non-thyroid origin. It is recognized that the absence of thyroid enlargement is not decisive; neither are such laboratory findings as blood cholesterol, blood iodine, urinary thyrotropic hormone assay, or the response to the administration of Lugol solution, infallible. Two types of cases in this group can be best interpreted as **pseudo-hyperthyroidism,** due to abnormal end-organ response. One type is represented by the patient who consistenly shows high BMR's without major signs of hyperthyroidism — a counterpart of pseudo-hypothyroidism.

Mrs. D.K., 43 years old, married 20 years, has four children. Menstruation was regular until 10 years ago when hysterectomy was done with removal of one ovary. She has been in good health since except for "nervousness." Weight steady at 190 lbs., no increased perspiration or heat intolerance. Physical examination essentially negative. Pulse rate 84, blood pressure 150/95, blood count normal, blood cholesterol 170 mg%. BMR on four tests within two months: +35%, +27%, +52%, +30%. Lugol solution was then prescribed, 30 drops daily for two weeks. Following this the BMR was +65%, two weeks later, without medication during the interval: +28%. She was then given elixir of phenobarbital two teaspoons four times daily, for two weeks, following which the BMR was +20%.

The other type of apparent end-organ hypersensitiveness presents the following picture: tachycardia, palpitation, nervous and emotional instability, prominent eyeballs with stare, increased perspiration, heat intolerance, but no enlargement of the thyroid, and the BMR is within normal limits. Administration of Lugol solution does not relieve the symptoms which suggests that the symptoms are not due to excessive thyroxin production. In these cases the vegetative nervous system is the end-organ which seems to be hypersensitive to the thyroid hormone, while another end-organ function—represented by the BMR—responds normally.

End-organ sensitiveness is an element in **true** hyperthyroidism as well. The great discrepancies of symptoms occasionally observed in this disease—e.g., lack of tachycardia in some cases, lack of elevation of BMR in others, etc. — are evidently due to variations in the response of specific end-organs to the excessive amounts of thyroxin.

(B) PSEUDO-PARATHYROID DISTURBANCES

I. The only cases of **pseudo-hypoparathyroidism** described in the literature are those of Albright, et al. (1). Briefly, this series of three patients showed the following features: (a) typical symptoms of tetany; (b) low blood calcium and high blood phosphorus; (c) large amounts of parenterally administered active parathyroid extract failed to change the blood calcium and phosphorus values toward normal, and failed to produce a phosphate diuresis. Administration of dihydrotachysterol resulted in normal blood Ca and P levels with relief of tetany. One of the patients was operated on, and the parathyroid glands were found normal. None of the three had previously received parathyroid extract (which could have possibly caused production of anti-parathormones. Albright et al, concluded that these are cases of end-organ resistance to parathyroid hormone and, concerning the nature of such resistance, mentioned the possibility of "deficiency in or interference with some hypothetical substance with which the parathyroid hormone reacts."

There may be other cases of pseudo-hypoparathyroidism which have not been recognized as such for the following reasons: (1) Surgical interference is not called for and, accordingly, histological examination of the glands is usually not made; (2) In therapy, parathyroid hormone is rarely used, the irradiated ergosterols such as dihydrotachysterol being less expensive, less dangerous, more convenient and equally efficient. As a result, resistance to parathyroid hormone would not be discovered unless a test for that purpose is employed. This should be done in every case of idiopathic parathyroid deficiency to differentiate the true form from the pseudo form.

II. Reports of **pseudo-hyperparathyroidism,** i.e., hyperparathyroid-like syndromes attributable to increased sensitiveness of the end-organs rather than excessive production of parathyroid hormone, are not available in the literature. However, there are several types of disturbances for which this possibility could be considered. It should be recalled in this connection that the earlier view about the parathyroid hormone being a one-end-organ hormone has recently been found unsatisfactory. It was thought that this hormone acts directly on the kidneys alone, causing phosphate diuresis; and that changes in the blood and bone follow that action secondarily. But newer experimental evidence indicates the existence of at least two end-organs—kidneys and bone—upon which the hormone acts simultaneously and more or less independently. On this basis, hypersensitiveness of only one end-organ would result, in the presence of normal parathyroid secretion, in pictures like (a) cystic bone changes, normal blood calcium and phosphorus, no parathyroid tumor; or (b) no bone changes, high blood calcium and low blood phosphorus, no parathyroid tumor. Actually such pictures with or without additional features do exist, although hypersensitiveness of the end-organ as a possible cause was not taken into consideration.

One of these diseases has been earlier described under the name of osteitis fibrosa disseminata or focal osteitis fibrosa systica, and is now generally known as **polyostotic fibrous dysplasia** or **Albright's disease.** The bony lesions are similar to those found in hyperparathyroidism, with some differences: they are spottily distributed with normal bone between; there is no generalized osteoporosis; the bone lesions have a tendency to be unilateral; radiolucent areas suggestive of bone cysts actually consist of fibrous masses replacing bone marrow and causing bulging of the cortex; however, occasionally actual bone cysts are seen with a microscopic picture suggesting giant cell tumors. There are no changes in calcium and phosphorus balance, and parathyroid tumors are not found. Associated findings are: brown, non-elevated pigmented patches of skin which tend to be on the same side as the bone lesions, and endocrine disturbances manifested by acromegaloid changes, bitemporal hemianopsia, hyperthyroidism, skeletal precocity, and—in the female—sexual precocity. The disease develops in childhood but is not hereditary. It is not clear whether the associated endoctrine disturbances are independent additional anomalies or develop as sequels of the bone changes around the hypophysis and hypothalamus. The disease is regarded as a congenital developmental disorder. This developmental disorder (or that part of it which affects the bones) probably consists of an abnormal end-organ response, i.e., hypersensitiveness to the parathyroid hormone.

There are other disorders of bone metabolisms consisting in various forms of decalcification although entirely unlike the one characteristic for hyperparathyroidism; among them are **senile osteoporosis, multiple spontaneous symmetrical fractures** (the Milkman syndrome), **Paget's disease,** and **osteoporis resulting from inactivity.** There are no distinctive changes in blood calcium and phosphorus, and the parathyroid glands appear to be normal. One or the other of these might well be due to abnormal end-organ response to the parathyroid hormone, but at present no data are available to test this speculation.

(C) PSEUDO-ADRENAL DISTURBANCES

I. Conditions of marked **general asthenia** associated with low blood pressure, muscular weakness, fatiguability, secondary anemia and emotional depression, in the presence of normal adrenal structures and in the absence of other debilitating disease have been attributed by some clinicians to "mild" or "functional" **adrenal deficiency.** This assumption does not explain the experience that in these cases laboratory findings and tests fail to indicate *any* adrenal hormone deficiency, and that therapy with increased salt intake and adrenal hormone preparations (which is so successful in Addison's disease) completely fails to relieve the signs and symptoms. More satisfactory seems to be the contention that these types of constitutional asthenia may be due to *failure of an end-organ—the vegetative nervous system* — to respond normally to an adrenal hormone. Moreover, this contention can be tested in investigating in these cases the pharmaco-dynamic response to various adrenal hormones, as compared with the responses in normal people.

II. **Hirsutism in women** may be due to tumor of the anterior pituitary or the adrenal cortex, the ovary, pineal gland and hypothalamic region. These cases usually show other signs of the glandular disturbance, especially signs of masculinization, such as hypertrophy of the clitoris and major labia, regression of the internal genitalia and breasts, amenorrhea or hypomenorrhea, male configuration of the body, loss of scalp hair, etc., and the excretion of 17-ketosteroids in the urine is usually high. In another, much larger, group of hirsutism in women the associated signs of masculinization are less marked or minimal; no tumors are found and the 17-ketosteroid excretion is within normal limits. Hypertrichosis in these subjects usually develops soon after puberty or during or after pregnancies or in the menopause, and it is assumed that it is due to minor — hyperplastic — changes in the anterior pituitary or adrenal cortex. Finally, there is a group of women in whom hirsutism is not accompanied by any signs of glandular disorder; there are no signs of masculinization; menstruation is regular and normal; the anomaly starts at puberty or earlier, and other members of the family, especially the mother, show it to some extent. In some there is marked excess of hair on the trunk, extremities and axillae with little if any excess of facial hair, while others show the opposite pattern. Seventeen-ketosteroid excretion is normal. This type probably represents *pseudo-hyperadrenalism,* i.e., hypersensitveness of the hair follicles to an adrenal steroid. In a case tested for this purpose, I was able to demonstrate hypersensitiveness of the hair follicles to an androgenic steroid; injection of a total of 200 mg. testosterone propionate over a period of 4 weeks—which is without visible effect on hair growth in normal women—caused marked further growth of facial hair in this subject.

(D) PSEUDO-HYPOGONADSIM (FEMALE)

1. **Hypoplasia of the breasts** may be part of a syndrome of ovarian or pituitary deficiency and is, then, associated with other signs of glandular disturbance, especially genital hypoplasia, amenorrhea or hypomenorrhea. This type of mammary hypoplasia in a young woman can be successfully treated by proper administration of estrogens or estrogens plus progesterone. Other young women with more or less marked hypoplasia of the breasts — or of one breast only — show no other signs of glandular disturbance, no genital hypoplasia, no menstrual disturbance; they may have one or several children; hormonal therapy usually fails to develop the breasts. These apparently are cases of **pseudo-ovarian deficiency,** due to resistance of the breast tissues to the ovarian hormones.

Recently I had occasion to attend to two cases of hypoplasia of the breasts, applying the same hormonal treatment. Mrs. M.S., 28 years old, has three children. Two years ago, hysterectomy (fibroids) with removal of one ovary. Half-year later noticed *regression* of breasts. Treatment with estrogen and progesterone resulted in satisfactory growth of the breasts.

Mrs. J. P., 28 years old, has one child. Menstruation regular and normal. The breasts have *always been hypoplastic.* Treament — same as above in every detail, same brands of hormones being used, for same length of time — was entirely unsuccessful.

There may be other types of end-organ resistance to ovarian hormones such as uterine hypoplasia (infantile uterus) and functional amenorrhea, in the presence of normal ovarian and endometrial functions as indicated by the cyclic excretion of normal amounts of estrogen and pregnanediol, and the demonstration of secretory mucosal changes at monthly intervals. There has been considerable speculation about the underlying cause (4) but it is clearly not a

glandular disturbance and might be properly listed as some form of end-organ resistance.

II. The so-called virginal or puberal *mammary hypertrophy* usually has its inception shortly before or after the menarche and may lead in a few months to two years to enormous enlargement of the breasts. The hypertrophy is usually, though not invariably bilateral and diffuse, and most of it consists of adipose tissue; however, the subjects are seldom obese and as a rule display no endocrinopathic stigmata. It is occasionally encountered in several members of the same family which indicates that heredity may be a factor. The fact that this type of mammary hypertrophy developes at puberty and may show a new spurt of growth in the event of pregnancy, and that the estrogen content of the body fluids is within normal limits suggests that it represents an exaggerated end-organ response to normal ovarian hormones. (It may be added that true hyperestrinism in a young girl—e.g., due to granulosa cell tumor—produces acceleration of skeletal, with genital and secondary sex development but no disproportionate growth of the breasts.)

There is as yet no agreement as to the nature of the ovarian disturbance which leads to another form of mammary hyperplasia, known as **"chronic mastitis"** characterized by nodule formation, pain and sometimes discharge from the nipple. An excess of progestin, a deficiency or excess of estrogen, and a normal quantity of estrogen unopposed by an adequate amount of progestin have been considered as possible causes. However, Taylor (5) who carried out hormonal and endometrial studies in a large number of cases, found that the level of ovarian hormones appeared to be within normal limits in most of the cases. He therefore concluded that though an actively functioning ovary is a prerequisite to the development of this disease, it cannot be accounted for by "any simple quantitative abnormality of sex hormone physiology." That would suggest chronic mastitis as another type of abnormal end-organ response.

"Functional uterine bleeding" associated with endometrial hyperplasia has been linked in many cases to protracted follicular activity in the absence of corpus luteum formation, i.e., to true glandular disturbance. However, it is also known that in endometrial hyperplasia an increase of the estrogen level is not a constant associated finding. In summarzing the relevant data, Hoffman (6) concludes: "It would appear that, in the receptive endometrium, hyperplasia may arise whether the estrogen level is excessive or within normal limits. . . . Undue reactivity of the receptor organ rather than an inherent disturbance in estrogen metabolism . . . would seem to be an important factor in the etiology." Accordingly, endometrial hyperplasia with functional uterine bleeding in the presence of normal estrogen levels seems to be due to abnormal end-organ response, while the similar condition in the presence of excessive estrogen levels is due to true glandular disturbance. This would explain why hormonal treatment is so disappointing in some cases, and so successful in others.

(E) PSEUDO-HYPOGONADISM (MALE)

Normally the size of the penis is quite variable in different individuals, being probably more independent from the general build of the individual than any other part of the body. Occasionally, marked plus or minus variants occur of which the minus variants may be of clinical importance. These may be found in otherwise well developed men, thoroughly masculine in all primary and secondary characters except for the penis which is disproportionately small to infantile. There is normal sex impulse and activity. Puberty was normal—except for the failure of the penis to grow normally — indicating that there was no lack of sex hormone at any time. These men show great anxiety about their anomaly, sometimes signs of a serious anxiety neurosis. Regardless of the amounts of testosterone propionate administered, no noticeable growth of the penis can be produced in these cases, in marked contrast to the prompt growth of penis which follows the treatment in cases of eunuchoidism.

(F) PSEUDO-PITUITARY DISTURBANCES

I. Are normal variations in skeletal growth —the small, medium and tall stature—in normal men and women due to variations in the production of the growth hormone or to variations in *the response of the growing tissues to the growth hormone?* This question will not be definitely answered until assays of the growth hormone in body fluids will be available. This is also applicable to the question of the nature of the

anomaly in the "primordial dwarf" and in the "normal giant," i.e., abnormal variations of growth in otherwise normal persons. That such variations might be due to abnormal end-organ response, is suggested by cases of partial gigantism, hemihypertrophy of the body, etc., which can be reasonably classified as end-organ-response anomalies.

II. Each of the pituitary tropic hormones acts on a specific end-organ, on an endocrine gland. Thus, for the thyrotropic hormone the end-organ is the thyroid gland; for the gonadotropic hormones, the gonads; for the adrenotropic hormones, the adrenals, etc. Decreased response of the end-gland would result in hypoplasia and decreased function of the end-gland, exaggerated response would result in hyperplasia and hyperactivity of the end-gland. This might well be the cause of *hypoplasia* of an *endocrine gland* in the presence of normal (or excessive) amounts of the tropic hormone, and of *hyperplasia* of an *endocrine gland* in the presence of normal (or decreased) amounts of the tropic hormone. Such "idiopathic" or "primary" hypo- and hyperplasias of the thyroid, gonads and adrenal with the resulting funtional disturbances do occur, and can be differentiated from the analogous "secondary" hypo- and hyperplasias of pituitary origin by way of tropic-hormone assays. They may be due to abnormal end-organ response to the pituitary tropic hormone.

(G) END-ORGAN RESPONSE TO INSULIN

It is well known that marked variations in the blood sugar response to insulin may occur and, due to their importance in the treatment of diabetes, these variations have been the subject of extensive study. Moreover, this particular hormone response can be quite exactly measured, several tests being available for this purpose.

1. In some cases of diabetes excessive amounts of insulin are required, for more or less extensive periods of time, to control the blood sugar. Such lack of response to administered insulin was found to be due to poor absorption of the injected insulin from the subcutaneous tissues, to insulin-neutralizing antibodies in the blood, or to acidosis, incidental infections, complicating liver disease, hyperthyroidism, Cushing's syndrome, pineal gland tumor; while in the majority of cases no complicating condition was present on which to place the blame. Obviously, in the first two types of cases the active amounts of insulin are lessened; therefore they do not represent end-organ insensitiveness. However, in most or all of the other conditions listed end-organ insensitiveness seems to exist.

Aside from such incidental and transitory decreases in the response to insulin in the same person, there are constant differences in the insulin responsiveness of different individuals. Judged by the Himsworth test, all individuals diabetic or non-diabetic, can be divided in two groups, those who are insulin-sensitive and those who are insulin-insensitive. This led Himsworth and Kerr (7) to assert that two basically different types of *diabetes* exist: the insulin-sensitive in whom the disease is primarily due to lack of insulin, and the insulin-insensitive in whom it is due primarily to "impairment of insulin action." This would classify the first type as a true glandular (islet) deficiency, the second type as a pseudo-glandular (end-organ) deficiency. On the basis of clinical behavior and findings Taub, Shlaes and Rice (8) suggested the liver as the place of the abnormal response, i.e., the end-organ involved, in the second type. However, the question whether a *pseudo-glandular type of diabetes* exists will probably not be definitely decided until quantitative insulin assays in the blood of diabetics will be feasible.

2. A somewhat similar problem exists concerning **chronic hypoglycemia.** There is no doubt that this disease may be due to true glandular disturbance such as islet tumor, Addison's disease, pituitary or thyroid deficiency. However, at least two types of hypoglycemia have been observed without signs of any glandular disturbance, and in these end-organ anomaly may be considered as the underlying cause. One type clinically resembles "hyperinsulinism" in every way, but no islet tumor can be found. Here again the final answer to the question whether this type of hypoglycemia may be due to end-organ hypersensitiveness rather than excessive insulin production will probably depend on insulin assays in the blood, if and when they will be available. There is another type of hypoglycemia described by Portis (9) and others as "neurogenic hypoglycemia" associated with "vagotonia" and fatigue. Wilder (10) suggested that this hypoglycemia may be the result of di-

rect nervous influence on the glycogen mechanism of the liver, in which case it could be classified as a form of end-organ anomaly.

(H) END-ORGAN RESPONSE OF ADIPOSE TISSUES

Various peculiar types of fat distribution in the subcutaneous tissues have been attributed to specific glandular disturbances, but most of these assertions are purely speculative (11). However, there is no doubt that the girdle and mammary fat deposits in male castrates, eunuchoids and hypogonads are connected in some way with the change in the production of sex hormones; likewise, the upper body fat deposition that appears in women who have a masculinizing tumor. At the same time we occasionally see fat deposition of the first type in apparently *normal* men, and the second type in *normal* women. There is no evidence that these are due to "mild" or "borderline" glandular disturbances in these individuals, as has been assumed by some observers. It is more reasonable to ascribe them to abnormal response of this particular end-organ—the regional fat tissue—to normal hormonal influences, in view of the "solitary" and constitutional-hereditary nature of these anomalous fat deposits.

SUMMARY

Clinical syndromes, resembling in many or all details specific glandular disturbances, may develop on the basis of abnormal end-organ response to hormones in the presence of normal glandular activity. Several such types of pseudoglandular disturbances simulating glandular deficiency and hyperactivity are listed and briefly described, and the possibility of such origin is suggested for certain other anomalies.

* * *

REFERENCES

1. *Albright, Burnett, Smith and Parson,* Endocrinology 30:922, 1942.
2. *Morgan,* Proc. Exp. Biol. & Med. 13:31, 1915; and 15:3, 1917.
3. *Rony,* Obesity and Leanness, Lea & Febiger, Philadelphia, 1940. p. 262
4. *Hoffman,* Female Endocrinology, Saunders Co., Philadelphia, 1944. p. 300
5. *Taylor,* Surg. Gynec. & Obstet. 74:326, 1942.
6. *Hoffman,* l. c. p. 337.
7. *Himsworth and Kerr,* Clin. Sci. 4:119, 1939.
8. *Taub, Shlaes and Rice,* Ann. Int. Med 22:852, 1945.
9. *Portis,* J. Am. Med. Asso. 126:413, 1944.
10. *Wilder,* Clin. Diabetes and Hyperinsulinism, Saunders Co., Philadelphia, 1940. p. 357
11. *Rony,* l. c p. 159.

THE GROWTH, REPRODUCTION AND LONGEVITY OF RATS ON VARIOUS DIETARY REGIMENS

ANTON JULIUS CARLSON*

THE results of studies made by McCay on rats at Cornell University have revived interest in food restriction as a means of prolonging the life span. However, the dietary regimens used by McCay stunted the growth of rats and therefore could not be regarded as suitable for human application. It seemed to us that the life span of rats could be prolonged without a stunting of growth by more or less intermittent fasting or by the simple feeding of a bulky diet including a more satisfactory type of bulk-former than the ground cellophane which McCay used. In connection with this intermittent fasting and a trial of bulk-formers, it was believed to be best to use an omnivorous diet including meat as the main source of protein; but Wu and his associates at Pieping found that female rats fed a vegetarian diet lived longer than females fed omnivorous diets. It therefore also appeared worth determining the effect of vegetarian diets in our studies. These studies involved two life span studies on rats and short term studies of growth and reproduction in successive generations.

In our first life span study, we (1) used 137 rats of the Wistar strain and tested the effect of 4 diets and 4 regimens. The diets consisted of a basal or low residue omnivorous diet including 35% meat protein and 28% fat; this diet with 10% alfalfa stem meal added, the same diet with 5% purified kapoc and 5% psyllium seed husks added and a simple vegetarian diet containing 50% whole wheat flour and enough vegetable protein concentrates to provide 30% protein. The regimens tried with each diet consisted of feeding the diet ad libitum and fasting 1 day in 4, 1 day in 3 or 1 day in 2. To assure a good state of nutrition before the specific experimental diets were used and intermittent fasting was begun, the rats were allowed to nurse or were at least left with their mothers until they were 35 days old and all of the rats were fed ad libitum and alike until they were 42 days old. After that the rats were fed the different experimental diets and placed on the different regimens on which they were kept until they died.

It was found that the female as well as the male rats on the basal omnivorous diet lived longer than the rats on the simple vegetarian diet. The rats on the omnivorous diet with 10% alfalfa stem meal, which had a roughage effect equal to that of the vegetarian diet, did not live longer than the rats on the basal omnivorous diet; but the rats on the bulkier diet, including kapoc and psyllium seed husks, lived longer. The rats fasted only 1 day in 4 did not live significantly longer than those fed ad libitum. The rats fasted 1 day in 3 lived longer and were not significantly stunted in growth. The rats fasted 1 day in 2 lived still longer but were more or less stunted in growth. Fasting 1 day in 3 therefore seemed to be the optimum amount of intermittent fasting for the rats.

Sufficiently large variations in the life spans nevertheless occurred on each dietary regimen to raise the old question concerning the relative importance of nature and nurture in determining longevity. That is, the rats from some litters lived much longer than the rats from other litters but as the litters differed considerably in size and no two litters were obtained from the same parents, the relative influence of heredity and litter size could not be determined. The rats that were heaviest when 42 days old were found to live longest and this suggested the need of determining the effect of different diets at earlier ages. The results also suggested the desirability of determining the effect of beginning fasting later than at the age of 42 days, the effect of different types and amounts of bulk-formers and the effect of a self-selected vegetarian diet.

Accordingly, a second life span study on rats was undertaken (2, 3) but this study became somewhat curtailed because of conditions beyond our control and included tests on only 115 rats of the same strain. All of these rats were offspring of 1 male (and a son) and 4 females

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and all but 1 litter of 8 rats were the offspring of 3 of the 4 females. Litters of more than 8 rats were reduced to 8, 7 or 6 rats. The diets used included the basal or low residue omnivorous diet used in the first study, 5 types of bulky diets consisting of the basal omnivorous diet and 10% to 25% relatively pure bulk-formers and a self-selected vegetarian diet providing 12 to 14 items (mainly grains, legumes and greens) from which the rats could choose. To obtain data on the influence of the different types of diets when fed early in life, alternate litters from the same parents were started on different diets as soon as the rats began to eat but leaving the young with their mothers until they were 35 days old to permit supplemental nursing. About half of the rats were kept on the same diet throughout life while the rest were transferred to a different type of diet after they became 72 to 200 days old. Seventy rats were fed ad libitum throughout life and the remaining 45 were fasted 1 day in 3 after they become 100 to 200 days old.

In this study, the rats on the omnivorous diets also lived longer than those fed the vegetarian diet. The male rats fed diets with 10% added bulk lived longer than the males fed the low residue omnivorous diet but the females did not live longer when fed this level of added bulk. In fact, the life span of females fed ground cellophane or cellulose flour without added psyllium seed husks died sooner than controls. However, the life span of both males and females fed a diet with 25% added bulk and including psyllium seed husks lived longer than the rats fed the low residue diet. The prolongation of life produced by such a diet was approximately the same as the prolongation of life produced by fasting 1 day in 3.

In both life span studies, it was found that rats on the low residue diet and those fed bulky diets without psyllium seed husks tended to develop diverticula of the colon near the cecum. This was particularly true of rats fed a bulky diet early in life and the low residue diet later in life.

Short term studies of the effects of our omnivorous diets and the self-selected vegetarian diet on growth and reproductive performance in successive generations (4) indicated that practically uniform growth and reproduction occurred in 7 generations on the omnivorous diets but growth and reproduction became increasingly impaired in the successive generations of rats on the vegetarian diet. Only 3 generations of vegetarians were obtained and the last generation at the age of 42 days weighed only about 25% of the weight of offspring of omnivorous rats. No vegetarians were raised by their mothers at any time during 3 winters and only 37% were raised in summer. Most of the young were eaten by the vegetarians.

In short, our studies showed that the life span of rats can be prolonged without any significant stunting of growth by fasting 1 day in 3 or by including a suitable type and amount of bulk-former in the diet. The difficulty or practical impossibility of finding a satisfactory purely vegetarian diet consisting of common domestic foods was also emphasized by our results.

* * * *

REFERENCES

1. *Carlson, A. J. and Hoelzel, F.*, J. Nutrition, 31:363, 1946.
2. *Carlson, A. J. and Hoelzel, F.*, J. Nutrition, 34:81, 1947.
3. *Carlson, A. J. and Hoelzel, F.*, Unpublished Data.
4. *Carlson, A. J. and Hoelzel, F.*, J. Nutrition, 35:49, 1948.

School And Faculty Notes

New Board Members

The Chicago Medical School is pleased to announce four distinguished new members of the Board of Trustees.

Mr. Ralph Lazrus, Treasurer, Benrus Watch Corporation, New York.

Mr. Sam Laud, President, General American Transportation Corporation.

Mr. Allan B. Gellman, President, Elgin-American and Illinois Watch Case Corporation.

Mr. Harold Perlman, Attorney; Member, Board of Directors, Michael Reese Hospital.

Professor Ivy Speaks for the School

Dr. Andrew C. Ivy, distinguished professor of physiology and Vice-President of the University of Illinois, addressed a group of local philanthropists in behalf of The Chicago Medical School at a luncheon at the Standard Club on February 12. Dr. Ivy praised the School and the administration for the outstanding progress made to date. He urged the group to support the School generously to enable it to join the national family of medical schools on an equal basis. He further pointed out that their efforts would not only serve the School but would also be of great value to the community and the nation.

A direct appeal to the guests present was made by Mr. Harris Pearlstein, President of Pabst Brewing Corporation, for a $100,000 annual contribution, which met with a uniformly enthusiastic reception.

The Rev. John Evans, Vice-Chairman of our Board of Trustees, and Dean J. J. Sheinin were also speakers at the luncheon.

CMS Trustee Heads Health Plan

Mr. Lester N. Selig, Chairman of the Board of Trustees of The Chicago Medical School, has been named general chairman of the Chicago Industrial Health Plan, a program inaugurated January 1st and supported by more than thirty community groups. The program, designed to raise the standards of industrial health and medicine among 1,500,000 workers in Chicago and Cook County, will seek to carry out the recommendations made by the U. S. Public Health Service in the 1946 Chicago-Cook County Health Survey. At present the plan is financed with $15,000 contributed by the state, the American Red Cross, the Tuberculosis Institute, and the American Cancer Society; it is hoped that soon the industries themselves will contribute to the educational program.

Other officers include Dr. Frederick W. Slobe, executive committee chairman; Alexander Rlpchan, secretary; and Perry Shostac, executive director. A co-chairman, representing labor, to serve with Mr. Selig, has yet to be selected.

Dr. Sheinin Addresses AIMS National Convention

Dr. John J. Sheinin spoke to the national convention of the Association of Internes and Medical Students on December 29, 1947. He discussed "Trends in Undergraduate Medical Education", emphasizing to the physician that the patient must be treated with the concept of the patient as an integral human being. Medical schools should be teaching their students that the patient is an individual.

New Faculty Appointments

Samuel J. Meyer, M.D., Professor and Chairman of the Department of Ophthalmology.

Harry C. Rolnick, M.D., Professor and Chairman of the Department of Genito-Urinary Surgery.

Ben B. Blivaiss, Ph.D., Instructor in Physiology.

A. Robert Goldfarb, Ph.D., Instructor in Biochemistry.

Russell Von Milliser, Ph.D., Associate Professor of Pathology.

New Appointments to the Full-Time Clinical Staff

David A. Willis, M.D., Associate Professor of Surgery.

Peter Gaberman, M.D., Associate Professor of Medicine.

Donald H. Atlas, M.D., Ph.D., Assistant Professor of Medicine.

Allan E. Sachs, M.D., Assistant Professor of Surgery.

Nathan Flaxman, M.D., Associate in Medicine.

Along with the improvement of the clinical facilities of The Chicago Medical School, came a further perfection in the preclinical years by acquiring additional staff in the Anatomy department, Doctors Byron L. Robinson, M.D.; Harold S. Fish, Ph.D.; George Clark, Ph.D.; and Leon Henri Strong, Ph.D. Other new faculty members are George J. Scheff, M.D., Ph.D., who is Assistant Professor in Microbiology; Ernest Hartman, Sc.D., an Assistant Professor in Parasitology; and Leo J. Saidel, Ph.D., an instructor in Biochemistry.

Byron L. Robinson, M.D.

Dr. Byron Robinson

Dr. Robinson was born in Aconomowoc, Wisconsin, on March 30, 1892. He received his A.B. degree in 1914 from the University of Wisconsin. It was there also that the doctor received his Master's, and went on to the University of Minnesota to take his M.D. in 1924. Dr. Robinson was an assistant in Zoology and Anatomy at Wisconsin from 1913-1916. The doctor's next teaching assignment was as Assistant Professor of Anatomy at Iowa, which was preceded by his assistantship in Anatomy at the University of Minnesota. In 1925 Dr. Robinson became Professor of Anatomy at the University of Arkansas School of Medicine. In 1941, the doctor attained the honor of becoming the Dean of the Arkansas Medical School.

Dr. Robinson is a Fellow of the American Medical Association, the Association for the Study of Internal Secretion, and the American Association of Anatomists. He has written on:

Comparative Anatomy
Neuroanatomy
Pulmonary Plugs in Suprarenalectomy
Endocrinology
Brain Defect
Castration Atrophy and Theelin

Dr. Robinson is now an Associate Professor in Anatomy at The Chicago Medical School.

Harold Somers Fish, Ph.D.

Dr. Fish taught Anatomy at Johns Hopkins Medical School before he came to The Chicago Medical School. He also taught Histology and Embryology at the University of Maryland. Dr. Fish was born in Sidney, Maine, on March 5, 1903. Bowdoin awarded the doctor his A.B. degree in 1925, and in 1935 he received his Ph.D. from Harvard University.

Dr. Harold Fish

He was Professor of Biology at Presbyterian College in South Carolina from 1935-1941. In addition to medical school experience, Dr. Fish served as biologist at Colby College from 1928-1930, and held a teaching fellowship while at Harvard.

He is interested in and has written on: Cytology of the Somatic Cells of the Earthworm and the Taste Papillae of the Mammalian Tongue.

Leon Henri Strong, Ph.D.

Dr. Strong was born in Richmond, Virginia, on February 16, 1889. The doctor took his A.B. and B.S. (Biol.) degrees at the University of Arizona in 1911 and 1915, respectively, and continued his education at the Universities of Washington and California from 1917-1922. In 1925, Dr. Strong took his Ph.D. at the University of California. The doctor has had a vast amount of teaching experience. He taught high school in Oregon from 1916 to 1918. He was an instructor of Zoology at Oregon State College from 1918 to 1919. He resumed his teaching at Pacific University where he was a professor of Biology. He was offered a teaching fellowship in Zoology at the University of California, and in 1925 he became an associate. Dr. Strong started teaching Anatomy at the Indiana University School of Medicine and also taught Anatomy at the University of Utah from 1927 to 1928. He then went to the University of Michigan and taught Gross Anatomy there in the medical school until he came to C.M.S. in 1947, where he has become an Assistant Professor in our Department of Anatomy. His investigations include the early embryology of the vascular system, specific functional components of the cranial nerve musculature, and the mechanism of the laryngeal pitch.

Dr. Henri Strong

He is a member of the following societies:

Amer. Association of Anatomists
Amer. Genetic Association

George J. Scheff, M.D., Ph.D.

Dr. George Scheff

It is with pride that we welcome to our staff a man who has for the past thirty years devoted himself to research in various phases of microbiology and biochemistry. Dr. Scheff started his career in 1918 as a research member of the Department of Biochemistry at the University of Budapest, and in 1922 he received his M.D. degree at that school. After completing graduate work in chemistry and physics in Budapest, he went to the University of Pecs, Hungary. Dr. Scheff remained there from 1926 to 1938 during

which time he was an assistant professor and later an associate professor in the Department of Hygiene and Bacteriology. In 1929, he obtained the title of Privatdozent. On leave of absence between 1931 and 1933, he came to the United States to do research at Yale University where he held the Alexander Brown Coxe Fellowship. Five years later, he returned to this country for a permanent stay. He was accompanied by his wife, Dr. Irene M. Scheff, who is also a physician and collaborator on much of his work. Dr. Scheff held the National Tuberculosis Association Fellowship at Yale in 1941-42 and the following year received his Ph.D. in Bacteriology at that school. Prior to his coming to our school, he was an assistant Professor in the Department of Medical Research at Ohio State University.

In recognition of his outstanding work, Dr. Scheff has been elected to Sigma Xi and Delta Omega (Honorary Society in Public Health) societies. He is also a member of:

American Society of Parasitology
American Society of Bacteriology
American Society of Experimental Biology and Medicine

Ernest Hartman, Sc.D.

Dr. Hartman was born in Ragmond, Kansas, on April 25, 1896. He received his B.S. degree from Kansas College in 1922 and his Master's degree in 1924. In 1926 he received his Sc.D. at Johns Hopkins. While studying for his Master's degree, Dr. Hartman was an assistant at Kansas State College. From 1924-1926 he was a special assistant of the Internal Health Board of the Rockefeller Foundation. From 1926-1928 he was an instructor of Zoology at the University of Illinois. In 1928 he became Associate Professor of Biology at Lingnan University, Canton, China. In 1935 he became a Fellow, by courtesy, of Johns Hopkins. From 1936-1942 he was Assistant Professor of Bacteriology and Clinical Pathology at the University of Vermont College of Medicine. He belongs to the American Society of Parasitologists, the American Microscopical Society, and to the Society of American Bacteriologists. His interests are in Protozoology, Helminthzoology, and Bacteriology. Dr. Hartman is now Assistant Professor of Parasitology at The Chicago Medical School.

Leo J. Saidel, Ph.D.

Our Biochemistry department has been further honored and improved by the addition of

Dr. Ernest Hartman

Dr. Leo Saidel

Dr. Leo J. Saidel. Dr. Saidel hails from Lanark, Illinois, where he was born on August 22, 1916. He went to the University of Chicago, where in 1938 he received his B.S. degree in Mathematics. Dr. Saidel then received his Master's and Doctor's degrees in Biochemistry at Georgetown University in 1941 and 1946, respectively. While the doctor was attaining the above degrees, he was appointed research assistant in the Bureau of Dairy Industry of the U. S. Department of Agriculture. During the war years he was at Columbia's College of Physicians and Surgeons. Here he worked in the Office of Scientific Research and Development as a research associate in Biochemistry. The work he did was in conjunction with the blood fractionation program. From 1946-1947, and before joining our staff, he worked at a commercial pharmaceutical company.

Drs. Nice, Foa, Ryan, Smith, and Mr. Widrow of the Department of Physiology, and Drs. Essenberg and Clark of the Department of Anatomy, participated in the 32nd annual meeting of the Federation of American Societies for Experimental Biology. They presented papers on the following subjects:

J. A. Smith, P. P. Foa, H. Weinstein, A. S. Ludwig, and J M. Wertheim, *"Some Toxic Effects of Acid and Neutralized Thiamine Solutions."*

P. P. Foa and H. Weinstein, *"The Lipids of the Rat Brain in Choline Deficiency."*

A. H. Ryan, *"Sympathetic Reaction in Ulcer."*

G. Clark, *"The Lack of Effect of Estrogen in the Sex Skin of the Infant Male Chimpanzee."*

J. M. Essenberg, *The Effect of Nicotine on Maze Learning Ability of Albino Rats."*

The Department of Microbiology and Public Health, formerly the Department of Bacteriology, has put three new research laboratories into operation and is utilizing them to the fullest. The members of the department are concentrating on various research problems at the present time, among them being an attempt to bring about a biologic cure of tuberculosis through the use of streptomycin, a determination of the diagnostic utility of anti-antibodies, the effect of the possible deleterious influence of passive immunization on subsequent active immunization, an artificial kidney utilizing an isolated piece of bowel of the animal itself, the nature of the reaction in the Thomson phenomenon, the taxonomy of Histoplasma capsulatum, some technical aspects of the Gram stain, and the incidence of Entameba histolytica.

Further activities of the Department include departmental seminars held twice monthly in which current literature is presented and discussed by the various members. It has been arranged that interesting seminars will, from time to time, be published in The Quarterly.

An elective course in Immunology, to be presented in form of a seminar, will be offered during the spring quarter to a limited number of qualified students. It will be presented by the staff of the Department of Microbiology and Public Health.

Dr. George Clark, Associate Professor of Neuro-anatomy at C.M.S., delivered a paper on, "The Stimulation of the Motor Cortex in Unanesthetized Monkeys" at the Neurological Seminar of the Northwestern University Medical School on Feb. 4, 1948. The paper was very well received by all who attended.

Dr. Samuel J. Taub, F.A.C.P., was invited to give a lecture on Asthma before the American College of Chest Physicians in Milwaukee, Wis., on October 5, 1948. Dr. Taub was also invited to give the Oration in Medicine on Asthma before the students and faculty of the Nacional University of Mexico in Mexico City on October 18 of this year. The doctor, who has his office in Chicago, is known to many students and alumni for his clinics at the Cook County Hospital, where he is an attending physician on Ward 65.

Dean J. J. Sheinin, who was graduated from the University of Alabama in 1928, is Chairman for the School of Medicine's 1947 LOYALTY FUND, as announced by the HONOR ROLL of the University of Alabama.

Dr. George Clark, of the Department of Anatomy, attended the meeting of the Eastern Psychological Association in Philadelphia on April 16 and 17, where he presented a movie entitled, "Chimpanzees Reared in Darkness."

Dr. Ernest Hartman, of the Department of Microbiology and Public Health, attended the meeting of the Society of American Bacteriologists in Minneapolis, May 10-14. He presented a paper on, "Progressive and Regressive Staining in Relation to the Localization of the Gram Reaction."

Dr. Paul H. Kopper of the Department of Microbiology and Public Health became the father of a baby boy, William Daniel, on March 19.

The 61st session of the American Association of Anatomists was held at the Wisconsin University School of Medicine. April 21-23. The Department of Anatomy of The Chicago Medical School was represented by the presentation of five papers.

Harold S. Fish: *"Growth studies of the circumvallate papillae of the fetal tongue."*

George Clark: *"The lateral geniculate nucleus of the spider monkey.'*

E. D. Congdon (with Sutchit Saengwichian): *"Branching of the axillary artery in the Siamese."*

J. M. Essenberg: *"Structural and functional changes resulting from the administration of nicotine in different forms and at different age periods to the albino rat."*

Leon H. Strong: *"Primitive blood vessels of the brain of the rabbit as shown in thick sections of embryos injected by the living heart receiving opaque substance through the umbilical vein."*

* * * * * *

FACULTY PUBLICATIONS

Plzak, L. F.: *Modern Anesthesia,* J. International Coll. Surgeons, Vol. 10, No. 5, Sept./Oct. 1947.

Taub, Samuel J.: *Asthma,* Med. Clinics North America, Vol. 32, 230-44, January 1948.

Irwin S. Neiman & Erhard Loewinsohn: *Tuberculin Patch Tests,* Amr. Review of Tuberculosis, Vol. LV, No. 6, June 1947.

Irwin S. Neiman & Erhard Loewinsohn: *Inhibition of Primary Tuberculosis by BCG,* Amer. Review of Tuberculosis, Vol. LVI, No. 1, July 1947.

Irwin S. Nieman: *Prophylactic Value of Sulfathiazole Gum in Infectious Pharyngitis,* Archives of Otolaryngology, February 1948.

Frances P. Parker: *A Textbook of Clinical Pathology,* with contributions by Israel Davidsohn, M.D. William & Wilkins Co. 1948.

Rudolph Dreikurs: *The Challege of Parenthood,* Duell. Sloan & Pearce, N. Y. 1948.

Alumni News

Every once in a while we get messages from alumni. They are always welcome and we urge more letters so that your fellow alumni can look you up after the separation of graduation and we can keep in touch with you.

Many of the letters we get are announcements of various types, and some are retrospect, but the most pleasing are those which tell us that your Alma Mater is not out of your mind and that you are still ready to support it to your fullest. To those of us in school it tells much and teaches more. Well, this is exactly what happens when we are told of Dr. Samuel Pilchman, who is in the midst of his moving his office and home to Laurelton, Long Island, where the doctor and his wife have just bought a new home, has sent a pledge of $200.00. Although the time was not too appropriate for Dr. Pilchman, he knew of no better cause for his money. If that isn't enough, Dr. Pilchman hopes that he can increase his pledge the next time, he writes.

It just makes an undergraduate think—and I wonder how many graduates do the same?

1902

Dr. Adolph Thomas Gilhus died on December 6, 1946, aged 67, of coronary thrombosis. Dr. Gilhus entered the medical corps of the U. S. Army as a Captain on July 1, 1920, and was retired as a Major on Sept. 30, 1934. The doctor served in the Spanish-American War and in World War I. He also attended the College of Physicians and Surgeons of Chicago and the College of Medicine of the University of Illinois.

Since his discharge from service the doctor resided in San Francisco.

1905

Dr. C. C. Atherton passed away on February 21, 1947. Dr. Atherton of Union Grove, Wis., was Superintendent of the Southern Wisconsin Colony and Training School in Union Grove from Dec. 1, 1923 to the time of his death. His untimely exodus was a loss to both his community and the medical profession.

1926

Dr. August Fiora Baro was married to Miss Maryann Meyer, daughter of Dr. and Mrs. Karl Albert Meyer on the 24th of November, 1947, at Highland Park, Illinois.

1929

Dr. Morris Martin Rottman of Chicago died on March 15, 1948, at the age of 47, of coronary thrombosis. Dr. Rottman served in World Wars I and II, as well as being an extremely active man in the medical profession in Chicago.

1932

Dr. R. W. Patchell received quite a bit of unasked-for publicity. He returned from the East where he attended special courses in leading Eastern institutions. Dr. Patchell was fortunate enough to be one of 150 doctors in the United States to be chosen by Yale University to attend these courses, which included the study of alcoholism, sociology, psychology, and general health service. In addition, he took other subjects which included cardiac and circulatory problems. Research work in cancer took him to the leading hospitals in the East, including Boston City Hospital, Massachusetts General Hospital the Peter Bent Brigham Hospital, Ring Sanitarium, and the MacLean Hospital. It also brought him into contact with Dr. Malamud of Massachusetts Memorial Hospital and Harvard University. His studies also took him to the John Hopkins University.

The story of Dr. Patchell's journey appeared in the "Denni Hlasatil" (daily Bohemian publication in Chicago and suburbs), the Berwyn Beacon, and the Cheny Circle (official publication of the Chicago Athletic Association). Dr. Patchell has been a member of the C.A.A. for more than 15 years.

1935

Governor Meadows of West Virginia appointed a seven-man hospital licensing advisory board which included **Dr. Charles Warner** of Charleston, whose term will end on June 30, 1953. Dr. Warner is superintendent of the Mountain State Hospital of Charleston, West Virginia. We thank **Dr. Wakefield** for this information, and hope that some of our more outspoken alumni will tell us of those who are more reticent.

1940

Dr. Jacob Liftoff announces his return to practice at his new location at 756 Front St., Hempsted, Long Island, New York. We have no doubt that this move will be beneficial to the community as well as to Dr. Liftoff.

1941

Dr. Louis Berlin is the author of an article entitled, "Isolated Autonomic Phenomena in Conversion Neurosis," which appeared in the August, 1947 issue of the "University Hospital Bulletin." Dr. Berlin is an instructor in neuro-pathology at the Neuropsychiatric Institute in Ann Arbor, Michigan.

Dr. and Mrs. J. Dennis Freund announce the arrival of Kenneth Leslie on Sept. 19, 1947. Dr. Freund is on the faculty of The Chicago Medical School in the Department of Psychiatry.

On November 5, 1947, Cynthia Ester said "hello" to **Dr. and Mrs. A. Estin Comarr.**

1943

Dr. Samuel J. Cohen announces his return from military service and the opening of his office at 7646 170th St. in Flushing, New York. Don't forget to drop us a card in between one of those busy hours.

Dr. John Siegel was married to Iris Helene Bennett on March 6, 1948, in Houston, Texas.

1944

Dr. Carroll Berman was married to Miss Mona Solomon on Sept. 9, 1947, in Jersey City, N. J.

Dr. Jack Eliot Clare was married to Miss Gloria Karshan on Nov. 13, 1947, in New York City.

1945

Dr. Bernard K. Galston was married to Miss Marilyn Rose Glick on December 7, 1947, at the Blackstone Hotel in Chicago. Dr. Galston is the son of Dr. and Mrs. Samuel M. Goldstein of Newark, N. J.

Dr. and Mrs. William H Shlaes announce the arrival of their son David Mitchell on Dec 12, 1947.

Dr. Sidney S. Lazarus has announced the opening of his offices at 593 Dahill Road, Brooklyn, New York.

Dr. Howard N. Lesser can now be reached at 348 Union St., Brooklyn, N. Y., where he recently opened his office.

Dr. Louis Lazar recently began practice at 28 Peoria Street in Buffalo, N. Y.

As a matter of interest, **Dr. Irwin S. Rabeau,** now in service with the U. S. Public Health Bureau, is quoted in the Journal of the American Medical Association, October 25, 1947, page 500, "Medical Conditions in Alaska."

Drs. Forrest G. Byloff and **William D. Larson** invite us down to Kewaunee, Ill., to visit their very wonderful office at 105 So. Tremont Street.

Drs. Irvin Seaman and **Sidney Greenburger** have opened their offices for general practice at 3803 W. Lake Street in Chicago.

. . . the class of 1945 is well represented and seems to get along in pairs. Single or in pairs, we know that their practices will flourish and offer our sincere wishes.

1946

Dr. Louise Tumarkin and **Dr. Earl B. Zagove** decided to end their school romance and were married in Chicago on Nov. 2, 1947.

Dr. Bernard Tumarkin was married to Miss Ethel Best in August of 1947, in Chicago.

We learn from Miss Lynn Groupe that her "mommy's doing fine." Miss Lynn made her debut on Oct. 16, 1947. **Dr. Alvin Groupe** is the proud papa.

1947

Dr. Emanuel Chusid was married to Miss Alta Butkus in December, 1947, in Chicago.

Dr. Benedict Egan Liewen was married to Miss Jeane Louise Kosterlitz on August 27, 1947, at the Windermere East Hotel in Chicago. He has opened his office at 100 W. North Avenue, Chicago.

Dr. James V. Raia announced the opening of his office at 3954 W. North Ave., Chicago.

Dr. Bernard Z. Reisner announced the opening of his office at 4803 Milwaukee Ave., Chicago.

Another new graduate who is starting his practice is **Dr. Leonard C. Arnold,** who is located at 3324 W. Diversey Ave. and 10001 West Leland Ave. in Chicago.

Dr. and Mrs. Herbert Tetenbaum announce the birth of Barbara Lynn on Dec. 27, 1947. Dr. Tetenbaum is now interning in New York.

Dr. and Mrs. Arthur B. Sincoff announce the arrival of Susan Ellen on August 4, 1947.

. . . we realize that there must be more than the above arrivals; how about it alumni? . . . let us share the glory and offer our congratulations

Dr. Jerome A. Ehrlich was engaged to Miss Francine Silverman on August 22, 1947.

School Notes

Remember way back when you were "cutting it up" in Anatomy lab, trying to figure out the difference between a slim piece of fascia and the superficial peroneal nerve? Well, if I can take you back that far, let us look in and see the old Anatomy lab. Ah, here we see two diligent medical students who are dissecting and studying. Hmm—must have an exam tomorrow. Looks like Grant's Atlas on one end and Cunningham on the other end, and our two diligent medical students on their respective ends. Wonder what they're saying. Say, let's listen in! Comps coming up soon and maybe their Anatomy chatter will be a good review.

"Say, watch what you're cutting, will you—I'm not holding that muscle so that you can make a bloody stump out of my arm," says the fellow named Lee.

"What are you worried about, the blade's not sharp," the redheaded one says, and goes on mutilating or rather dissecting Lee's hand as well as the cadaver.

"Red, did you hear who's married?" Lee asks.

"No, who?" was Red's original answer.

"Al Tucker—you know Tuck—yep, he's married to Leah Glickman. Happened on March 21st. Pretty nice, huh? Leah's a nurse at Mt. Sinai Hospital."

"Yah," replies Red, "well that's nothing. Mel Eisenberg and Jacqueline Kramer were married on Dec. 25 of last year. Murv Freedland and Selma Friedman are hitched, too,—happened on March 20th."

"Say," says Lee, "everybody's doing it, why don't you get married, Red?"

"Let me alone, will you—I can't figure out if this cadaver is a male or female, and he wants me to get married. All I want to do is learn some Anatomy tonight—not who's getting married. Here's the scalpel, you cut for a while, maybe you won't talk so much."

About five minutes of intense studying went on and Lee dissected out the Pectoralis Major muscle, when Red said, "Some of the boys tell me that Sherwin Lutz and Annette Stern intend to live as cheaply as one, too."

"When did this happen?"

"The fellows said on the 28th of December of last year."

Lee dropped his scalpal, looked up and said, "You know I also heard that Maurice Sherman and Bobette Norton, Chester Meyer and Dorothy Andersen, and—who else is there—oh, yes, Larry Ravitch and Sally Miller are doing the same thing."

"Hmm," says Red wistfully, "these kids are starting late; the Irwin Morses celebrated their 1st wedding anniversary on April 3rd. And the Murray Leibermans celebrated their first anniversary on Dec. 25th, and you know what else, the Mike Scaramellas had a new addition to their family."

"No kiddin," Lee exclaimed, and in the meantime making sure to cut the blood and nerve supply to the Pectoralis Major. (Ed. Note. Since the Editor does not know the nerve and blood supply of the Pectoralis Major no further mention will be made to the above stated muscle.)

"Yep, it was a baby boy born on June 27th and his name is John Michael. Pretty nice, huh?, but that's not all the additions that came to C.M.S. in recent months. Al and Fran Blumenfeld trapped the stork into leaving them Richard Alan on Feb. 18th. Walter and Anne Bose also had a boy—Alan Henry—born on Feb. 29th, 1948—a leap year baby."

"Boy, who says these medical students aren't perpetuating themselves—that guy never went to C.M.S. Here we do everything in an efficient manner."

Lee's face shines with pride and then he looks at the dissection, and he once more assumes an eager, learned expression.

Red angrily retorts, "What are you so proud about, you haven't done anything, so shut up and start dissecting. Say, where are those nerves and vessels we were looking for?"

"Here they are!" Lee meekly says and there they were dangling from his forceps, never again to be of the cadaver lying in its bath of formaldehyde.

"Well, that's brilliant—whoever told you to go into medicine didn't care for humanity at all."

And thus we leave our two friends arguing about their respective attributes which entitle them to remain in medical school, having learned

nothing of anatomy but a great deal of the social life at C.M.S.

However, we may add that the Senior class of The Chicago Medical School will hold a Dinner Dance on June 6 at the Sherry Hotel. The affair is planned to commemorate the four years spent by the class in medical school. The entire faculty is being invited. Guest speakers for the evening will be Dean Sheinin and Dr. Oppenheim. A top notch band has been secured and the class will present an entire evening of interesting entertainment. The dance is under the direction of the Senior Class President, Herbert Lipschultz. The members of the dance committee are: Seymour Diamond, Sherman Feinstein, Leonard Goldman, Melvin Leichtling, and Howard Wilk. The entertainment for the evening is being planned by Stanley Reichman, Theodore Cohen, Dudley Neustein, and Robert Ostrove.

Among the senior social notes, it will be noticed that Mr. and Mrs. Sam Steinman announced the engagement of their daughter, Sarah, to Sherman Feinstein. The wedding will take place in June, in Minneapolis, the home of the prospective bride. Miss Steinman is a medical social worker at Cook County Hospital.

Also Mr. and Mrs. Sam H. Flamm anonunced the engagement of their daughter, Elaine June, to Seymour Diamond. The wedding will occur on June 20th at the Webster Hotel. Miss Flamm is completing her work for her Master's degree in social work at the University of Chicago, and that Mr. and Mrs. Martin Werner are expecting a new arrival sometime in April. Best of luck to all and everyone.

Book Review

PHARMACOLOGY A N D EXPERIMENTAL THERAPEUTICS. Hamilton H. Anderson, Fumiko Murayama, and Benedict E. Abreu. 368 pp. University of California Press, Berkeley and Los Angeles, 1947.

The compilers of this survey state that it is "an attempt to bring together significant studies in the field of applied pharmacology and toxicology" and that it is "designed merely to record the progress of basic research and clinical investigation during the war years." Only quantitative data are included in the survey and this has been done in order to relate the dosage to the specific effect produced.

The beneficial as well as the harmful effects produced by these biologics and chemicals are recorded, and, in addition, in vitro effects and in vivo activities in various species (as well as in man) are summarized.

Under each medical agent included in the survey, these is first noted the species; second, the effects produced; third, the dose level (in mgm. per kilogram whenever given); fourth, other data on the effects produced, whether beneficial or harmful; and fifth, the author, reference source, volume of journal, page, and year of publication.

By covering not only medical literature but also the literature of experimental biology, veterinary medicine, dentistry, pharmacy, and related fields as well, this survey is an extremely valuable reference work for workers in basic science laboratories and graduate students, as well as professional personnel.

AIMS NATIONAL CONVENTION

The Association of Internes and Medical Students held their national convention in Chicago December 27-29, 1947. Aside from the scientific program, in which many prominent medical men participated, the delegates passed upon a program of social ideas and action which we believe deserves to be widely disseminated.

Medical Education and Student Welfare

The Association of Internes and Medical Students feels that since the problem of medical education and medical student welfare are of the greatest interest to medical schools, hospitals and medical students, certain programs should be adopted. Among these are: a closer relationship between chapters to stimulate discussion and exchange of information; an increase in the G.I. Bill subsistence allowance, and state and federal aid for needy students.

Interne Education and Welfare

A.I.M.S. is organized to represent and serve internes and residents throughout the nation. A.I.M.S. will work toward correcting any deficiencies that exist in the hospitals. This program is directed toward the improvement of teaching facilities; improvement of working conditions; and readjustment of renumeration. In addition, A.I.M.S. reaffirms its stand against discrimination in the selection of internes.

Medical Economics and Sociology

A.I.M.S. reaffirms its resolution on a national health bill, which was adopted at the 1946 National Convention. It emphasizes that the American people have the right to adequate medical care and that a national health program must be universal in its application in a democracy.

On Discrimination in Medicine

Discrimination in the selection of medical students and internes is contrary to democratic ideals. Further, it creates a situation inimical to the welfare of all, by perpetuating inadequate medical care among certain minority groups and hindering medical progress. Thus A.I.M.S. shall base its program on the principle that there be no discrimination on the basis of race, sex, creed, political philosophy, national origin, or economic status.

National and International Activities

Medical science knows no national boundaries. The full and free exchange of knowledge and personnel between nations leads to improved standards of medical education and practice. Furthermore, such interchange gives rise to international understanding, the surest foundation of peace. A.I.M.S. will strongly support any activity leading to the fulfillment of the above principle. An additional resolution, passed by a vote of 56 to 17, rejected compulsory peacetime conscription, because "Compulsory peacetime conscription is inconsistent with the furtherance of the health of the people, the expansion of education, the elimination of discrimination, and the preservation of the spirit of free inquiry. By way of contrast, we reiterate the positive program of A.I.M.S."

However, before this resolution could be ratified it must be affirmed by a majority of the chapters.

New Books in the Library

Alexander, J. Life, Its Nature and Origin. 1948. 2 A Al 2

A.M.A. Glandular Physiology and Therapy. 1935. 14 K Am 3

Annual Review of Physiology, 1947. Vol. 10, 1948. 4 A A 7

Birkhaug, K. Iathergic Immunity in Experimental Tuberculosis. 1940. 12 M B 53

Boyd, W. C. Immunity. 2nd ed. c1947. 8 G B 70

Chicago. Municipal Tuberculosis Sanatarium. Collected Studies, Vol. 7, 1945.

Clark, W. M. Topics in Physical Chemistry. 1948. 36 Hp C 55

Dreikurs, R. Challenge of Parenthood. c1946. 36 S D 81

Gutman, J. Modern Drug Encyclopedia and Therapeutic Guide. 1941. 2 D G 98

Harvey Lectures. Ser. 42, 1946-47. 1 J H 26

D'Herelle, F. The Bacteriophage and Its Behavior. 1926. 9 C H 42

Jorpes, J. E. Heparin in the Treatment of Thrombosis. 2nd ed. 1946.

Kahn, R. L. Tissue Immunity. c1936. 8 J K 12

MacLeod, C. M. et al. Sulfonamidea. Annals of N. Y. Acad. Science. Vol. 44, art. 5. 1943. 22 Yc MacL 22

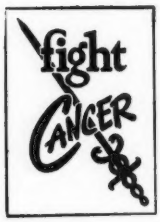
Nickerson, W. J., ed. Biology of Pathogenic Fungi. 1947. 9 K N 53

Osol, A. & Farrar, G. E. Dispensary of the U.S.A. 24th ed. c1947. 22 G Os 5

Quarterly Cumulative Index Medicus. Vol. 41, 1947. 1 B Q 2

Recent Progress in Hormone Research. Vol. 2, 1948. 5 K R 24

(Continued on page 38)



On April 1st, the Illinois Division, American Cancer Society, Inc. began its annual drive for funds to carry on the three-pronged attack against cancer — through research, education, and service to cancer victims. This year, the state goal is $1,150,000. Chicago's share will be $765,000.

Of all diseases, cancer is the most feared and the least understood. It is no respecter of persons. It strikes the rich and the poor, young and old, male and female. In the field of business and industry, it threatens one person in eight, a tremendous toll of executives, employees and customers.

Contrasted with these alarming statistics are two encouraging facts about cancer. Even on the basis of present medical knowledge and techniques, at least 30% and perhaps as high as 50% of those of working age who die of cancer today could be saved, if — through proper education — they could be brought to seek diagnosis and receive proper treatment in time. Secondly, cancer research offers hope of constantly increasing the number who can be saved.

These two encouraging facts are the basic reasons for the existence of the American Cancer Society and form the bulwark in its three-front attack on cancer.

Through research it is hoped that a cure for the disease will be effected. During the past year more than $3,000,000 has been given to the Society to 155 research projects and 42 research fellowships. In the State of Illinois, $122,202 was allocated to research projects including the University of Illinois, University of Chicago, Northwestern University, and Michael Reese Hospital.

The year-round educational program conducted by the American Cancer Society is expanding rapidly. Cancer is not hereditary or contagious. Yet the very thought that cancer may be the cause of an illness is sufficient to keep many persons from consulting their doctors. By educating the public to recognize the danger signals a large percentage of those who develop cancer can be saved. For most early cancers are curable. The Society's educational campaign is carried on through the newspapers, the magazines, and the radio, through schools, clubs and organizations, through movie shorts, educational pamphlets, employee groups and volunteer speakers. Sixteen information centers located throughout the State of Illinois are open to those wishing help and knowledge. Three centers at 4600 South Ashland Avenue, 4559 South Parkway, and 139 North Clark Street, serve the needs of Chicago citizens.

Service to cancer victims covers a wide field. Among these are:

1. Clinics and hospitals for diagnosis and treatment.
2. More modern X-ray equipment, radium and other necessary equipment for the treatment of cancer.
3. Detection centers — there are 2 in Chicago — where people may go to make sure they are free of cancer.
4. Visiting nurse and medical services for cancer patients in the home.
5. Refresher courses in cancer diagnosis and treatment for physicians.

Support of the American Cancer Society's campaign will give power and impetus to the attack on the most feared disease inflicted on mankind.

THE TIME TO
CONTRIBUTE
IS NOW!

●

Don't Forget our

GUARANTEE FUND

FOR **YOUR** SCHOOL
FOR **YOUR** EDUCATION
FOR **YOUR** STANDING

●

SUPPORT THE

CHICAGO MEDICAL
SCHOOL

GUARANTEE FUND

Have you ever had any fever, chills, night sweats . . .

NEW BOOKS IN THE LIBRARY

(Continued from page 35)

Rosebury, T. Experimental Air-Borne Infection. 1947. 9 B R 72

Sahyun, M., ed. Proteins and Amino Acids in Nutrition. 1948.

Salye, H. Endoctrinology. c1947. 14 L Sel 4

Stuhlman, O., Jr. Biophysics. c1943. 2 Ap Stu 9

Todd, J. C. & Sanford, A. H. Clinical Diagnosis. 11th ed. 1948. 7 Ah T 56

Trueta, J. Studies of the Renal Circulation. c1947. 16 J T 76

U. S. Census. Vital Statistics, 1945. 1947. 2 parts. 31 E Un 51v

Visher, S. S. Scientists Starred. 1947. 1 E V 82

NEW JOURNALS

Psychosomatic Medicine, vol. 10, 1948.

Archivic. Institudo biologico de defasa agricola e animal, vol. 1+, 1928.

Occupational Medicine, vol. 1+, 1946.

University Inn Restaurant

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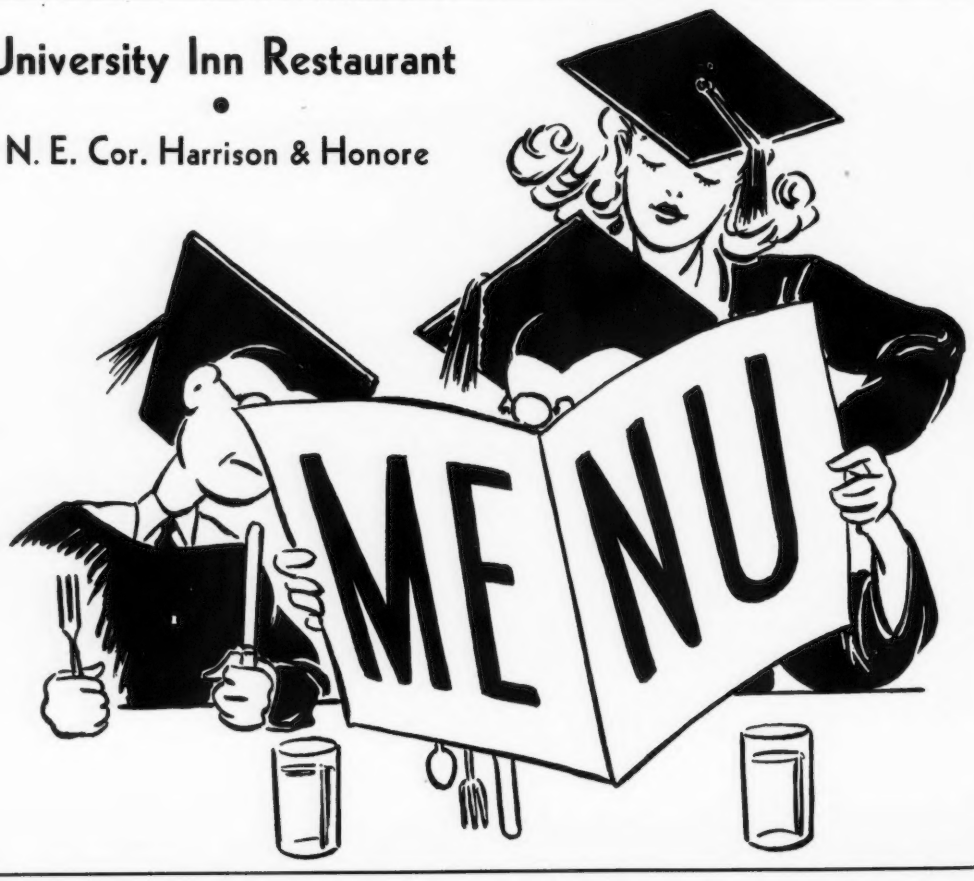
N. E. Cor. Harrison & Honore



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